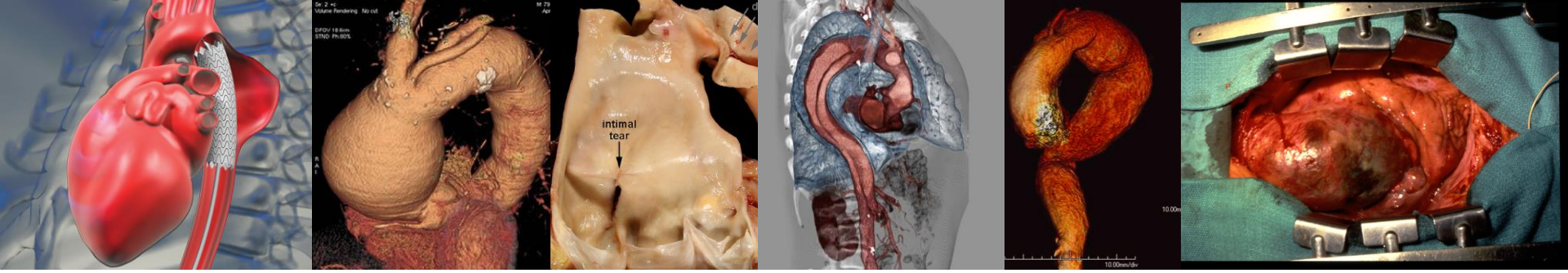

Surgical approach to Acute Type A Aortic Dissection

Maral Ouzounian MD PhD FRCSC

16th Annual Toronto TEE Symposium

November 10, 2018

Peter Munk Cardiac Centre

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Outline

- Surgical repair pf acute type A dissection
  - Challenges
  - Brain / heart management
  - Proximal / distal extent of resection
- Intraoperative TEE guidance

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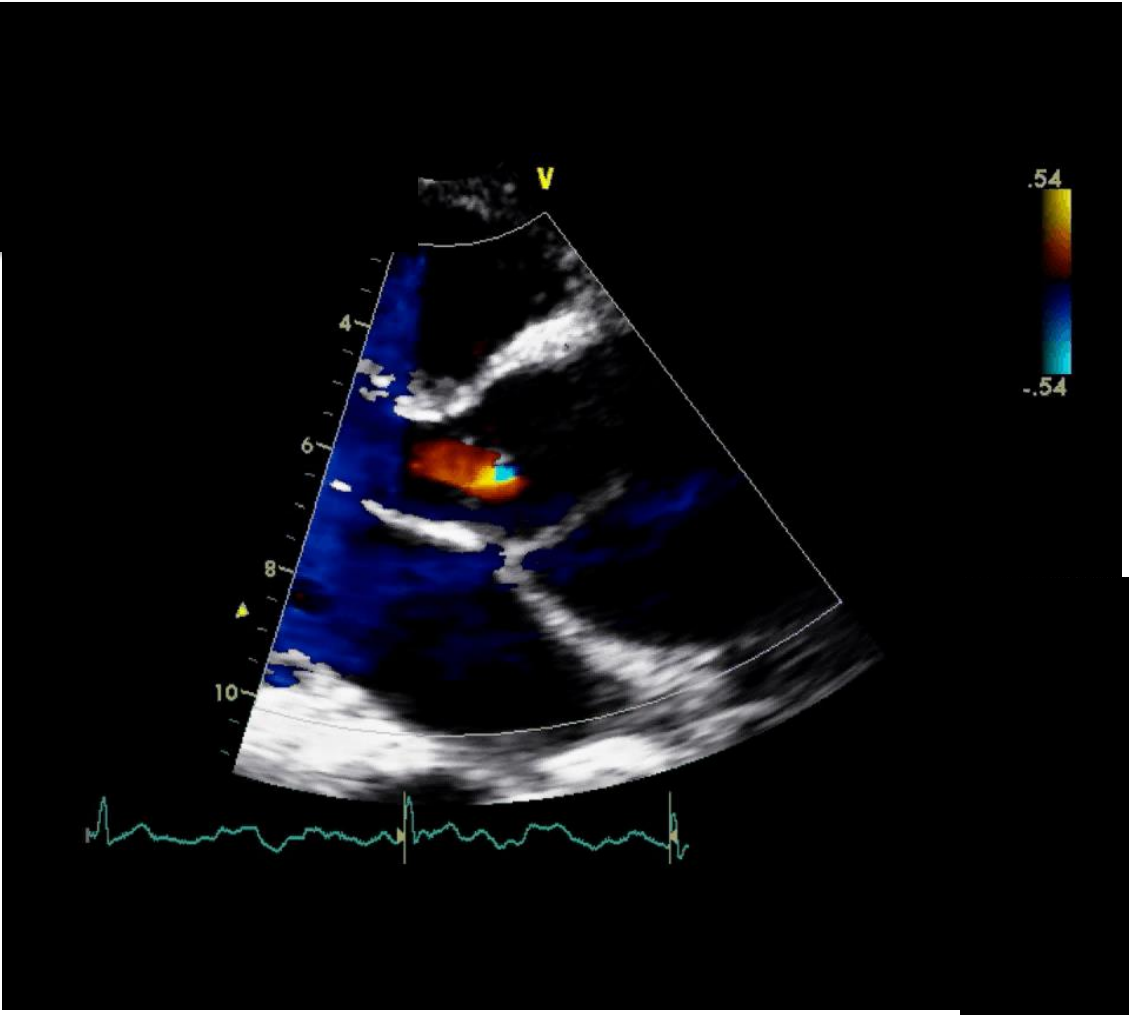
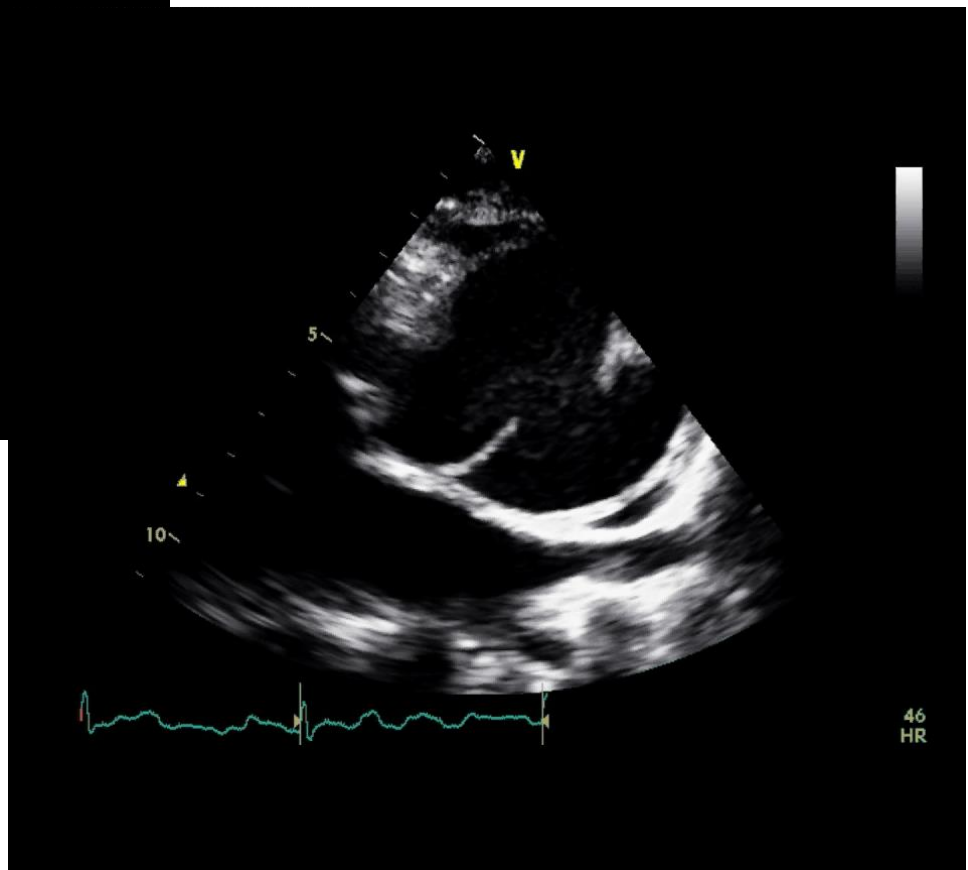
Case: Ms. GC

- 27 year old
  - MYH11 mutation
  - Mother had type A dissection at age 41
- Presents to local ER twice over a span of 3 days with severe chest pain
  - Felt to be MSK > D/C home without imaging
- Routine echo scheduled 3 weeks later

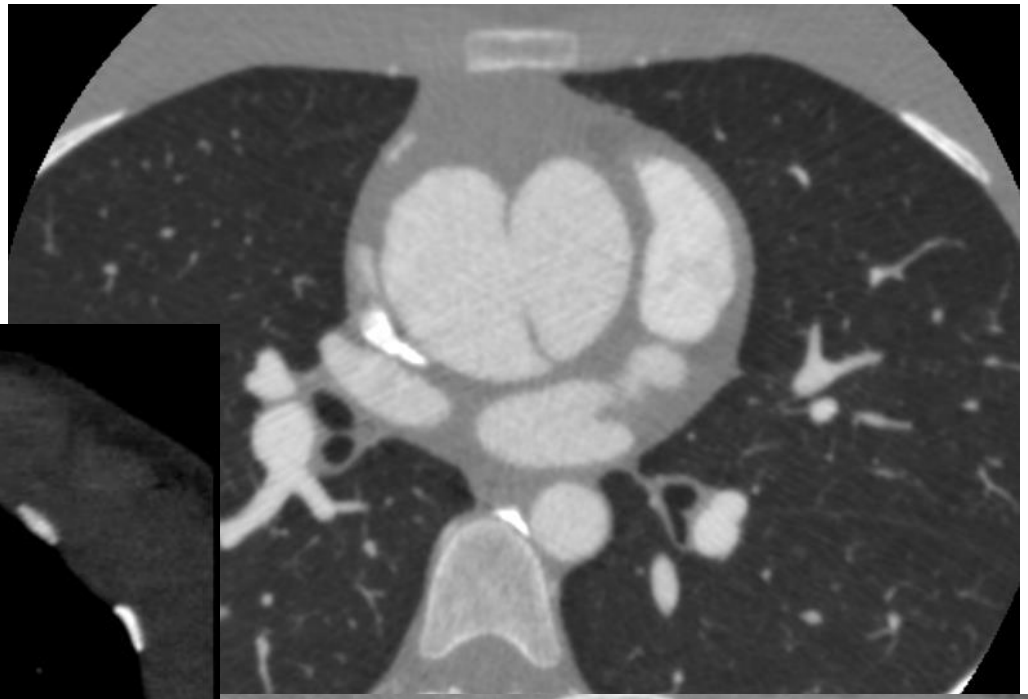
Case 1: Ms. GC

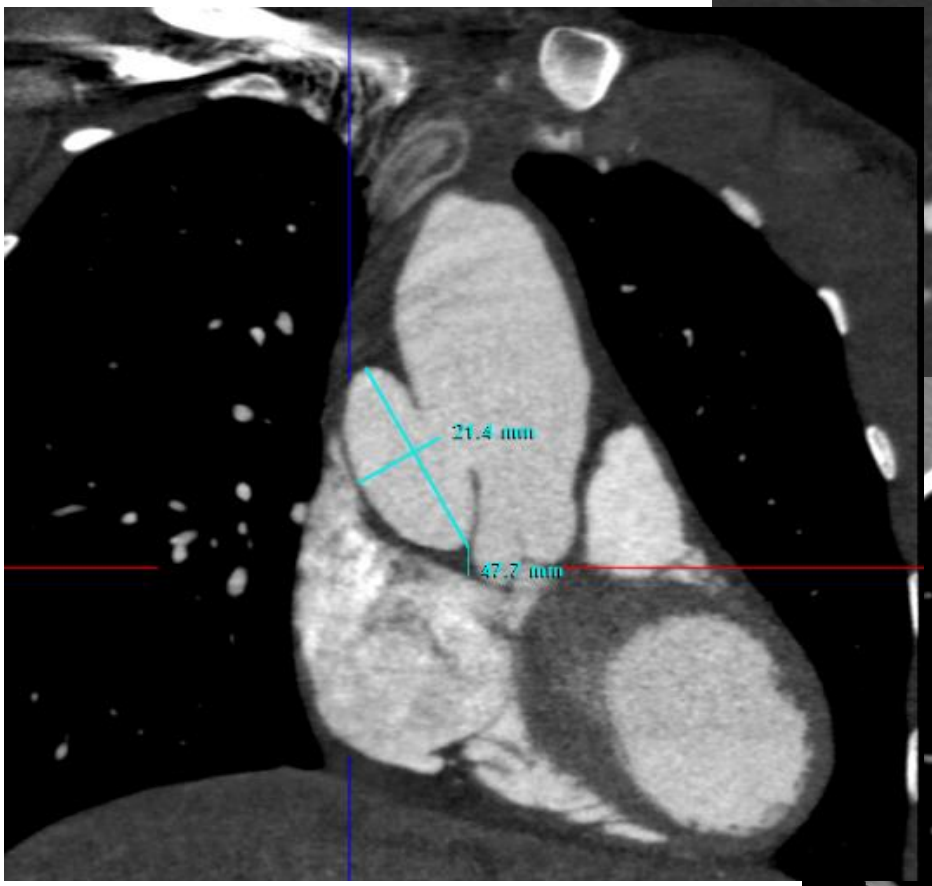
Routine TTE

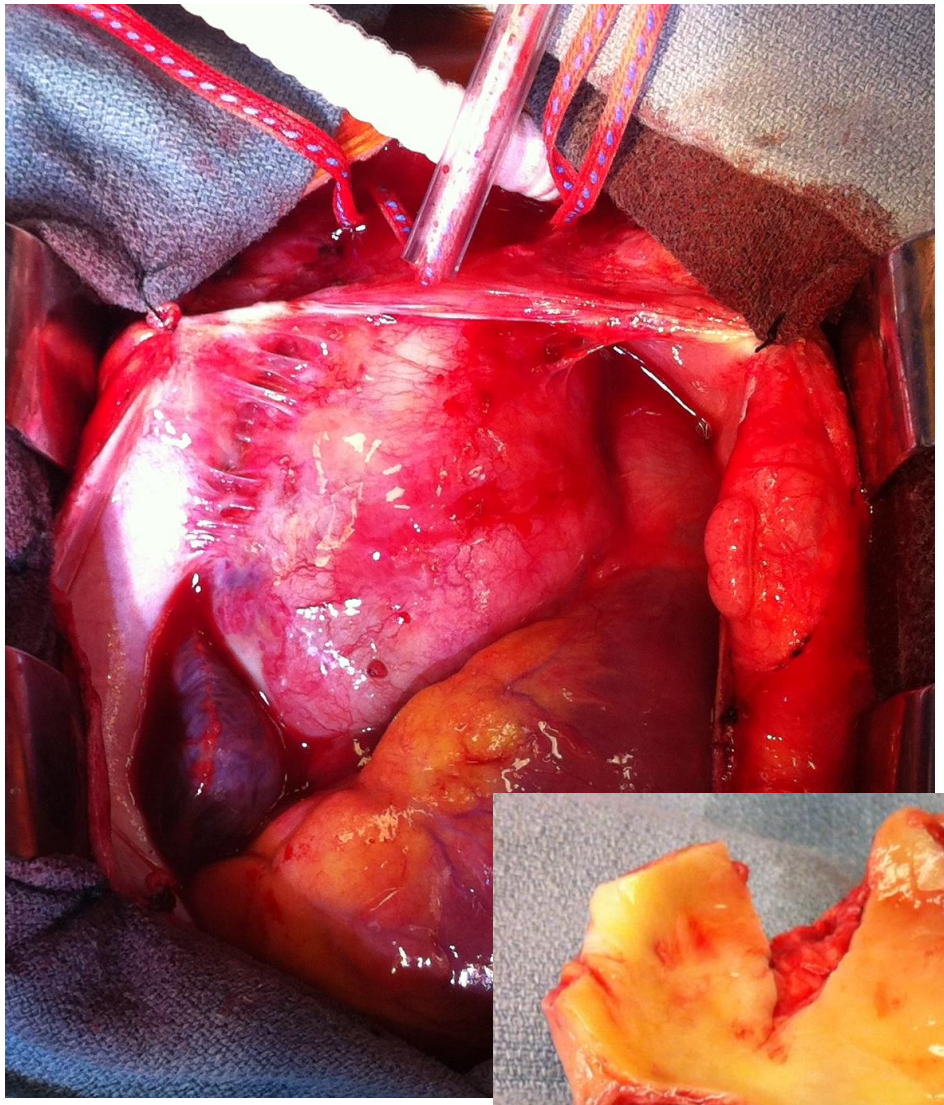


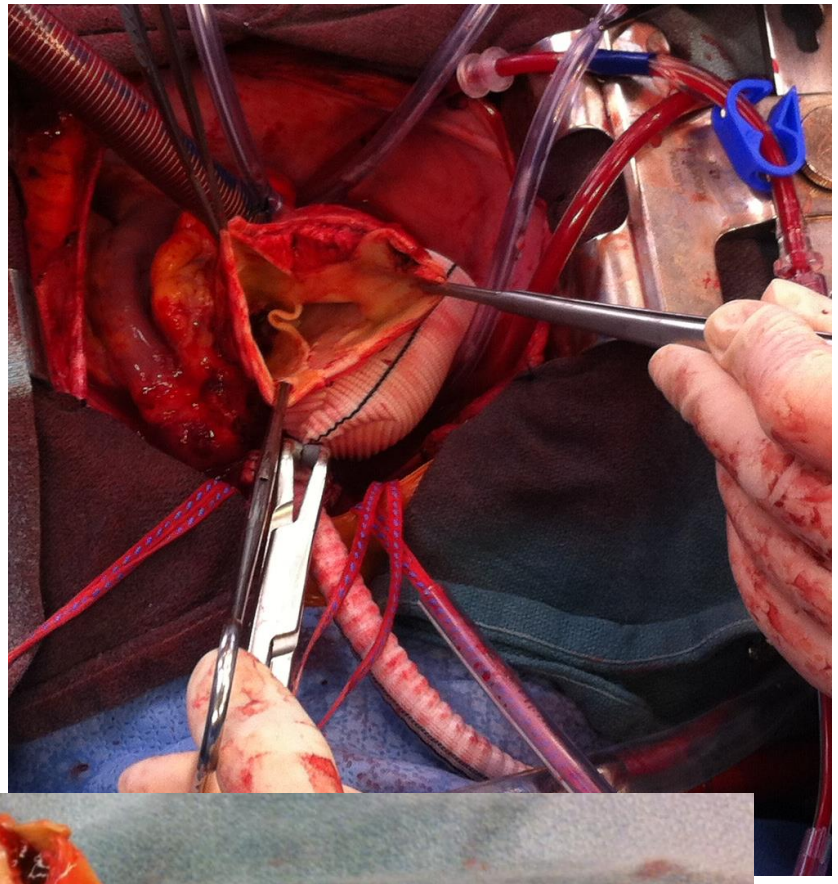


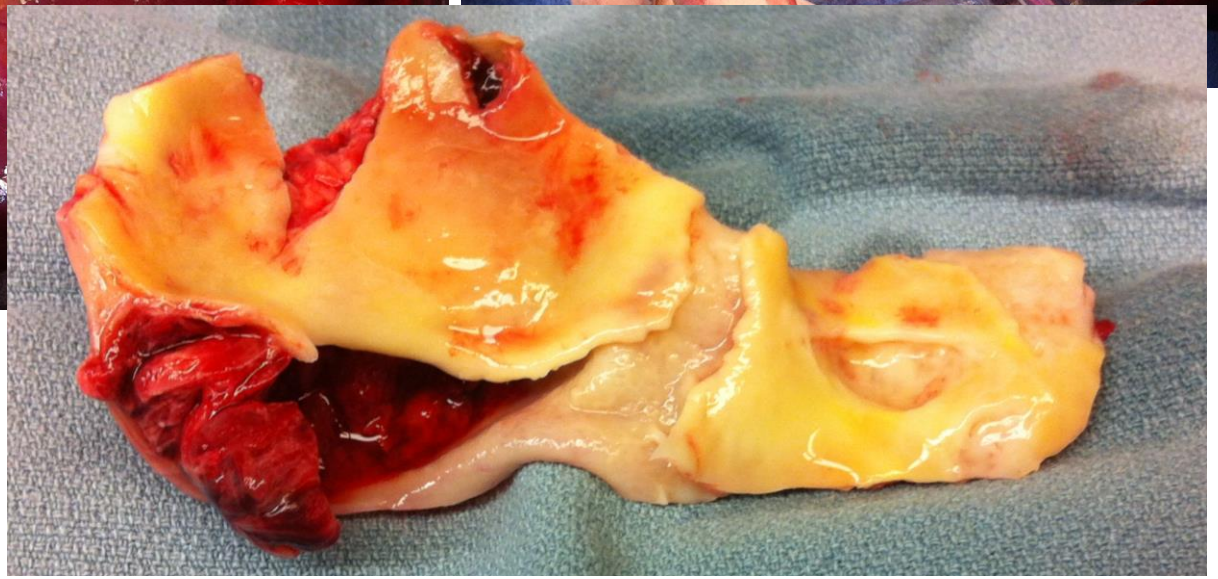
Case: Ms. GC





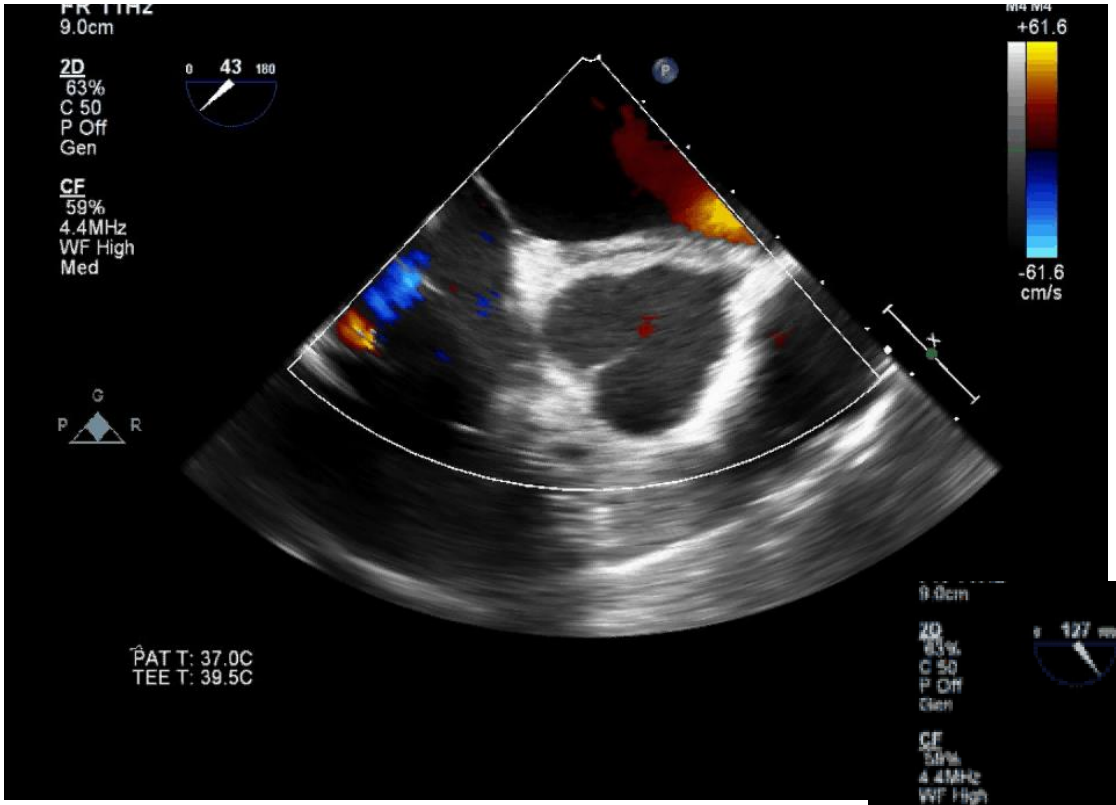


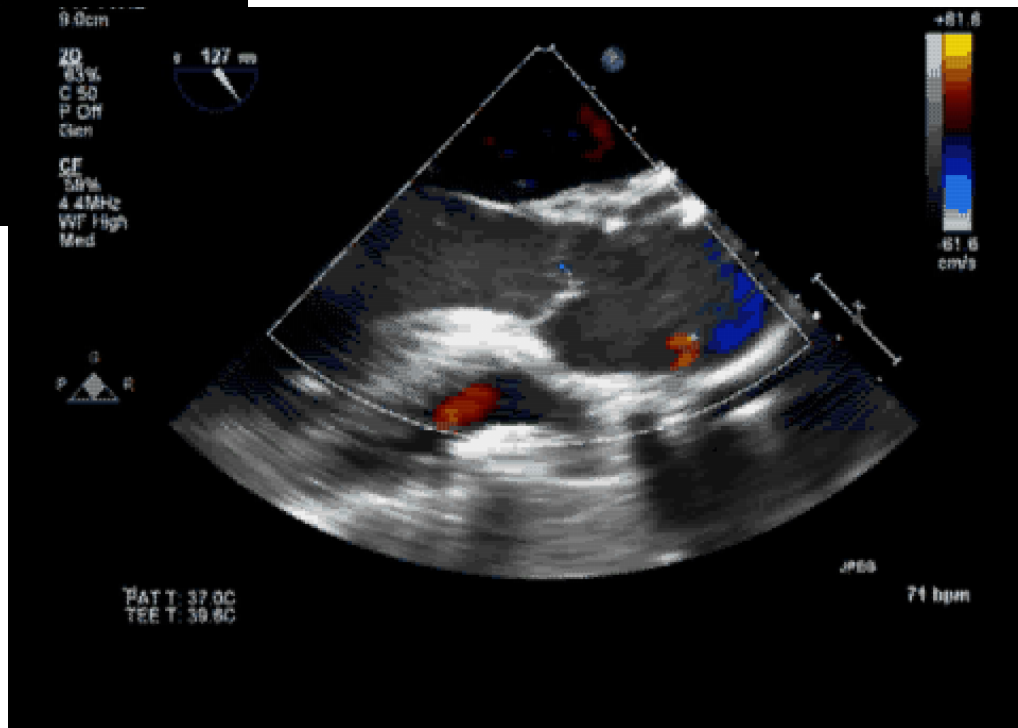




Case: Ms. GC

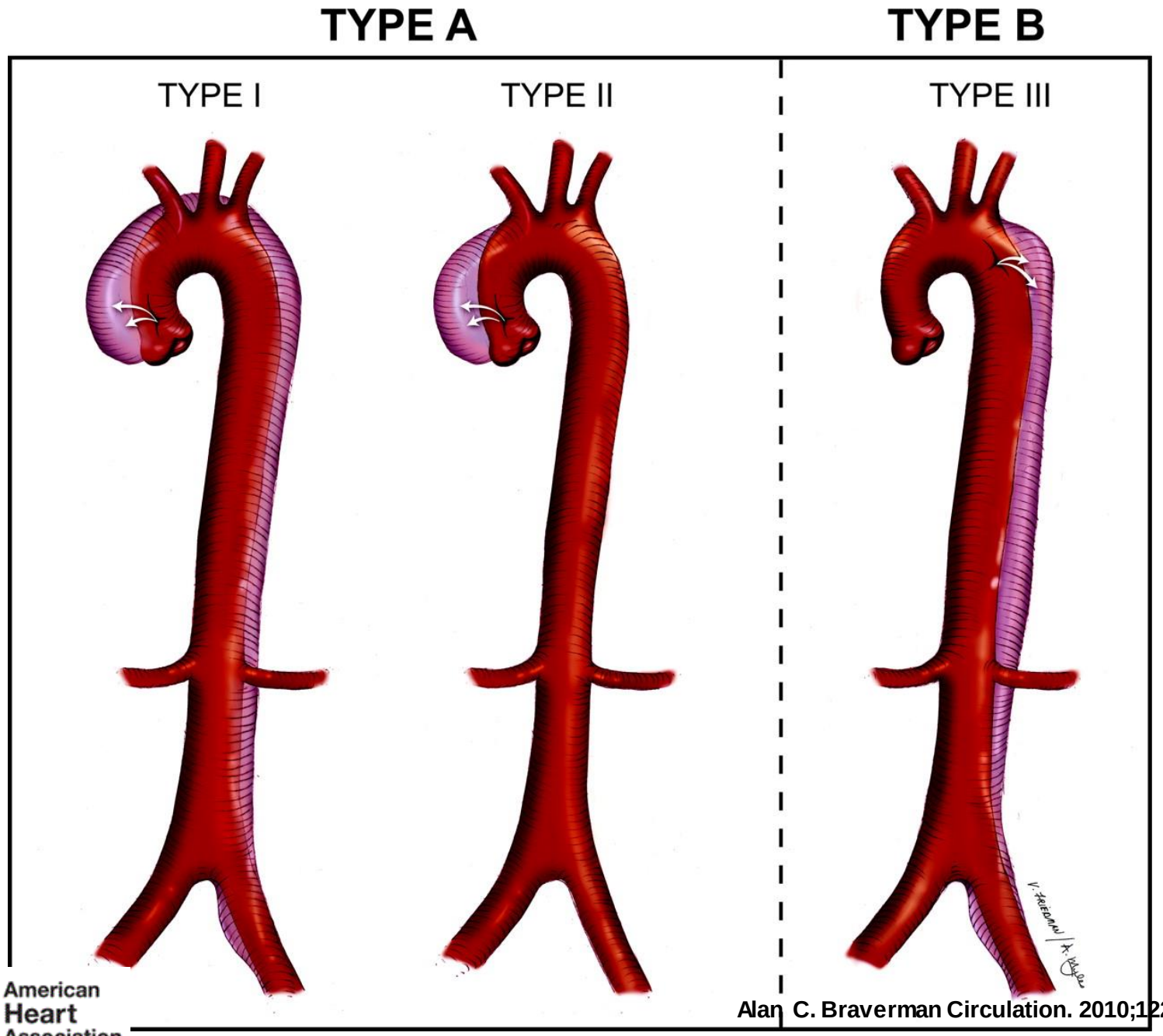
Post-pump TEE



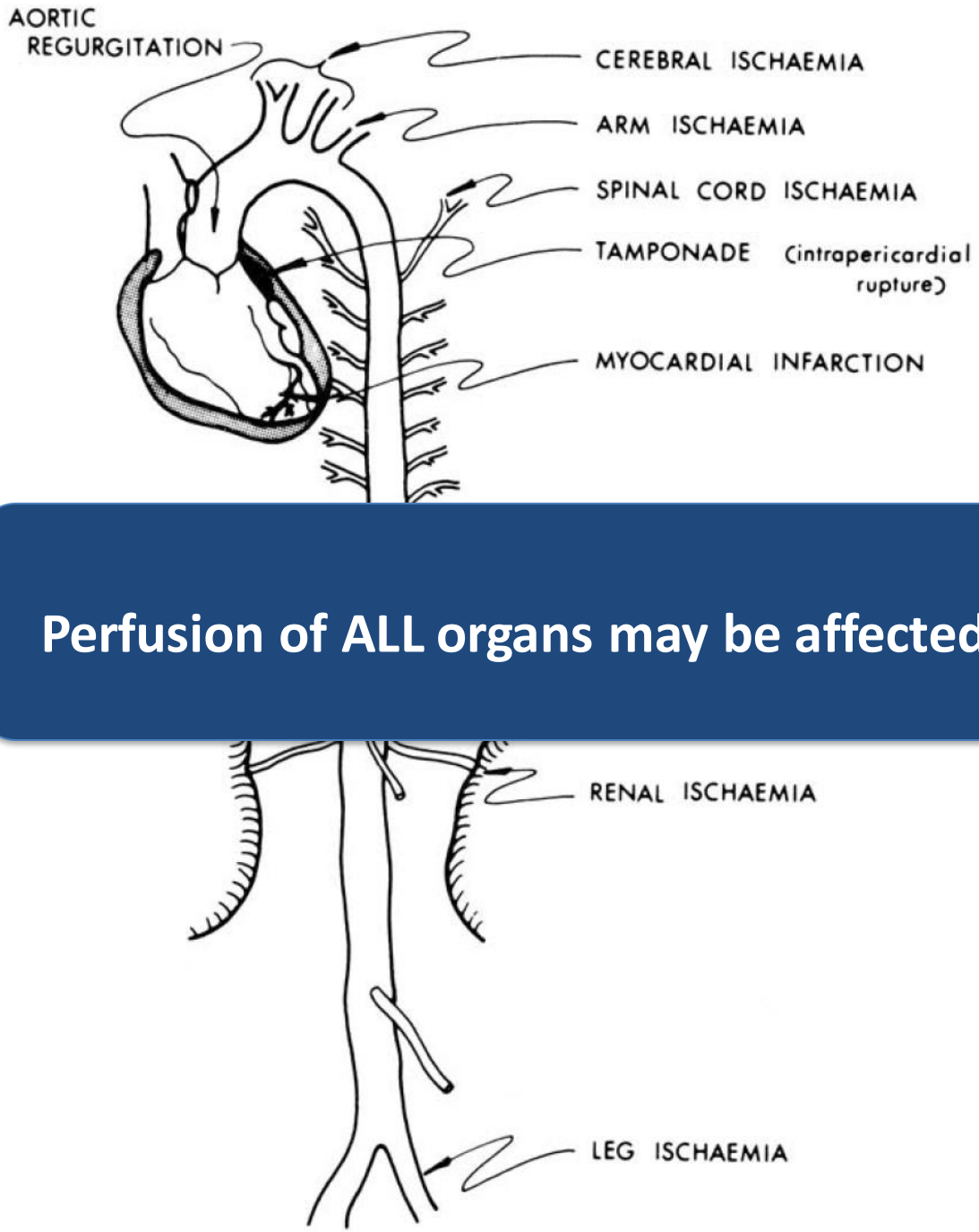


Case: Ms. GC

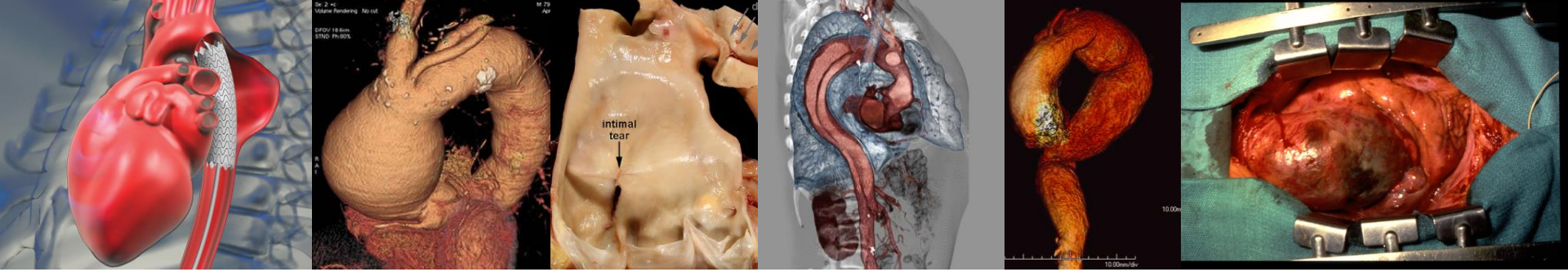
- Post-op course uneventful
- 3-year follow-up
- No AI
- Aortic root and arch unremarkable



Alan C. Braverman Circulation. 2010;122:184-188



Perfusion of ALL organs may be affected



Surgical challenges

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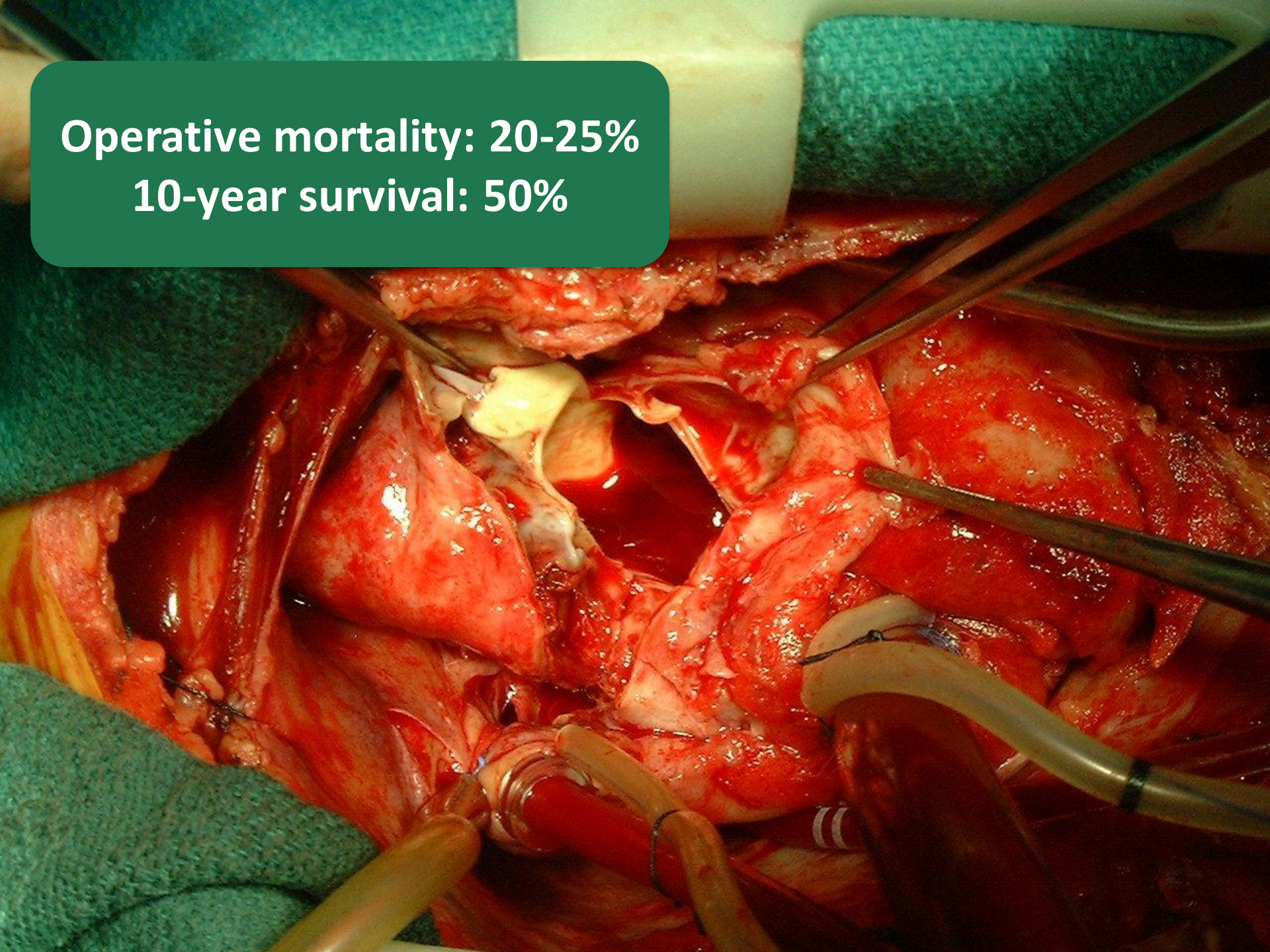

Operative mortality: 20-25%
10-year survival: 50%

Early mortality

With malperfusion: 30%
Without malperfusion: 6%

Prevalence of preoperative malperfusion: 33%

TABLE 2 Survival per Number of Pre-Operative Malperfused Organ Systems

Malperfused Organ Systems	Total	Survivors	Dead	Percent Dead per Group
None	1,420 (66.4)	1,241 (58.1)	179 (8.4)	12.6
1	494 (23.1)	389 (18.2)	105 (4.9)	21.3
2	139 (6.5)	96 (4.5)	43 (2.0)	30.9
3	53 (2.5)	30 (1.7)	23 (1.1)	43.4

Values are n (%).

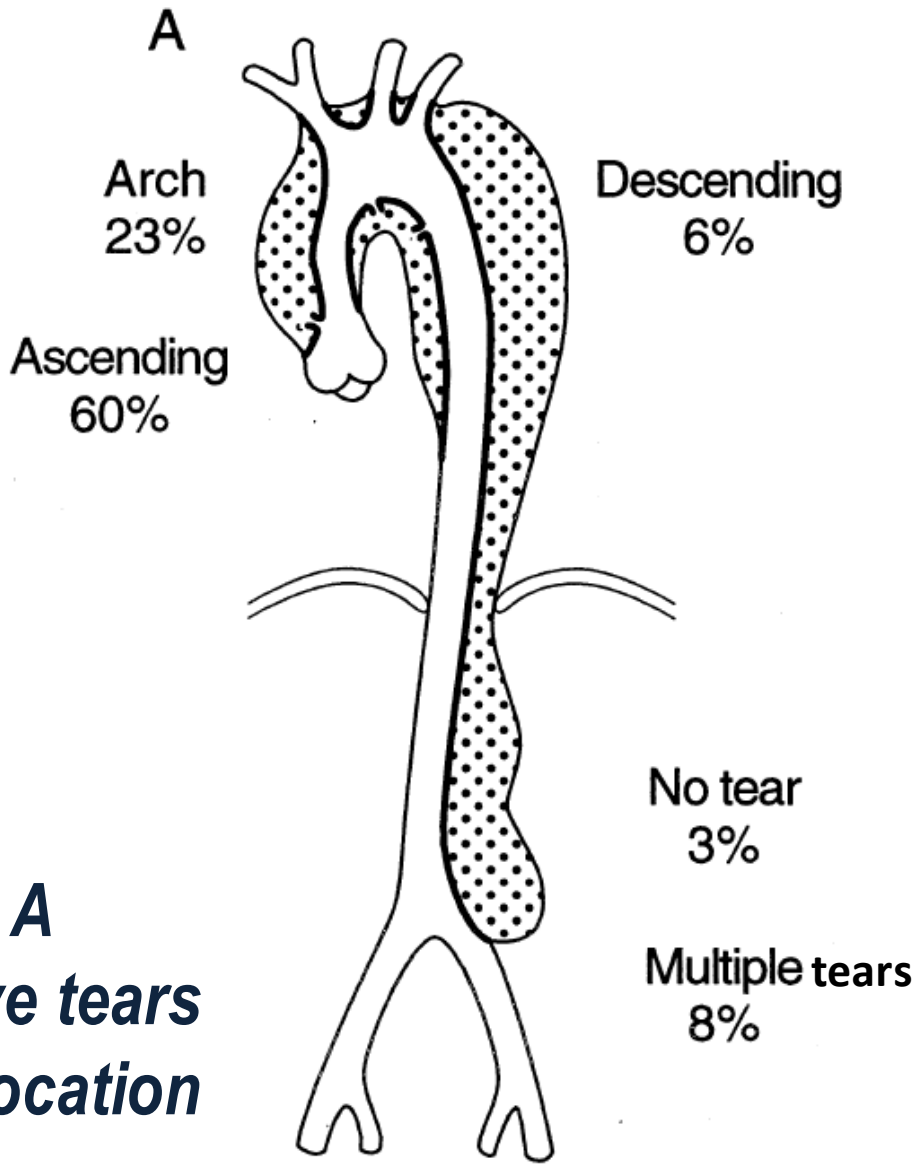
TABLE 10 Risk Factors for Death

	OR (95% CI)	p Value
Age	1.02 (1.01-1.03)	<0.001
Pre-operative peripheral malperfusion	1.43 (1.01-2.01)	0.042
Affection of supra-aortic branches	1.47 (1.13-1.89)	0.004
Pre-operative coronary malperfusion	1.61 (1.10-2.31)	0.012
Pre-operative spinal malperfusion	2.18 (1.11-4.28)	0.027
Primary entry tear in descending aorta	2.84 (1.37-5.59)	0.004
Pre-operative comatose state	3.42 (2.49-4.67)	<0.001
Post-operative cerebral malperfusion	2.18 (1.45-3.24)	<0.001
Post-operative visceral malperfusion	3.24 (1.94-5.35)	<0.001
Post-operative coronary malperfusion	9.54 (4.62-20.69)	<0.001

Abbreviations as in Table 4.

Czerny et al. JACC 2015

Location of Originating Tear: Acute Type A Aortic Dissection



40% of acute Type A dissection cases involve tears <u>other than</u> the classic location

Lansman *Ann Thorac Surg* 1999
Mt. Sinai 12-year Experience

Surgical decision points: Type A Repair

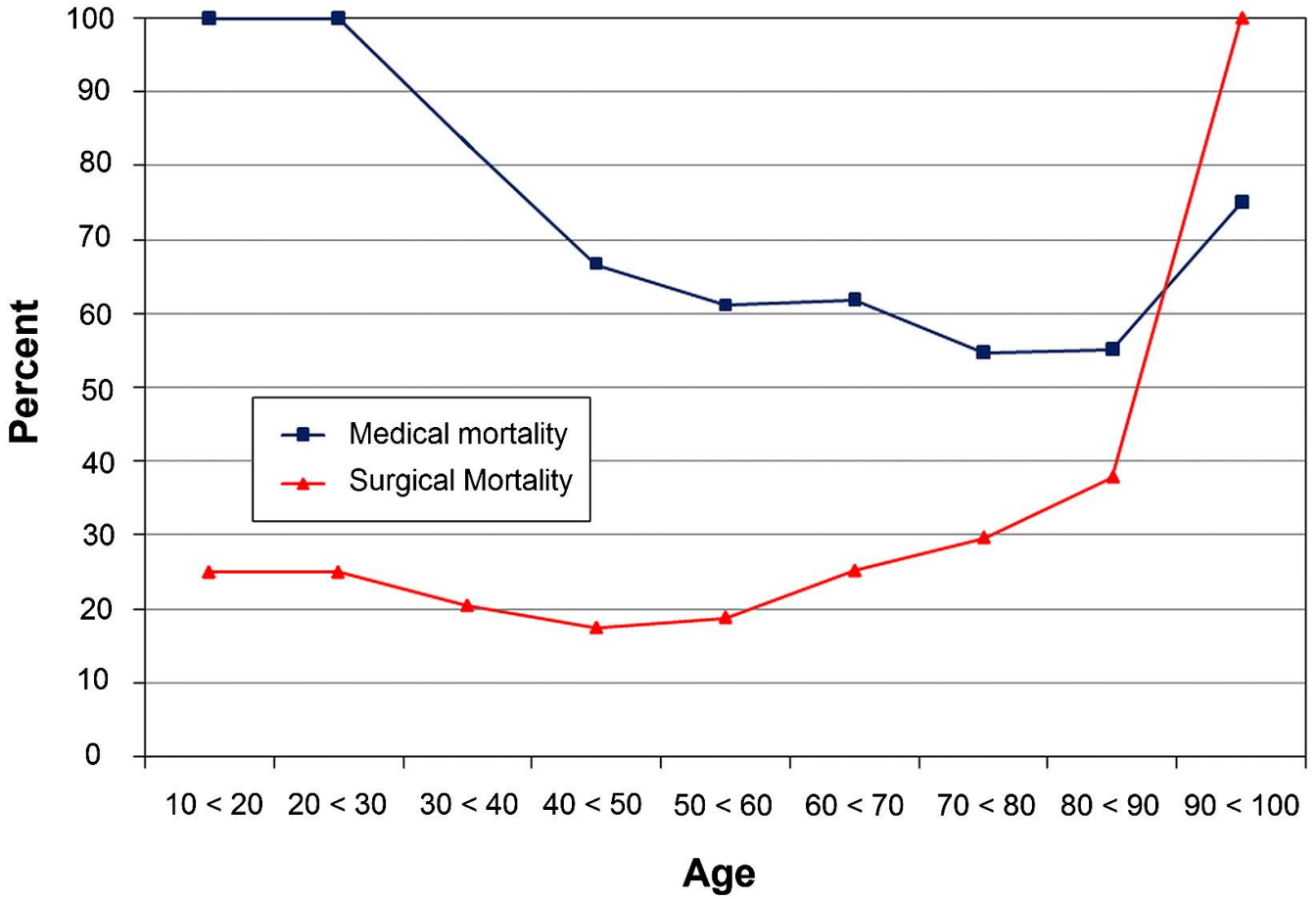
- Operate?
- Cannulation
- Temperature
- Clamping
- Heart protection
- Brain protection
- Proximal extent of resection
- Distal extent of resection

Operate?

- ***Almost*** everyone with a type A dissection should have an operation

- Considerations
  - Age?
  - Stroke?
  - CPR?
  - Limited life expectancy?

Role of age in acute type A aortic dissection outcome: Report from the International Registry of Acute Aortic Dissection (IRAD)



Trimarchi [IRAD] JTCVS 2010

Brain Injury and Type A Dissection

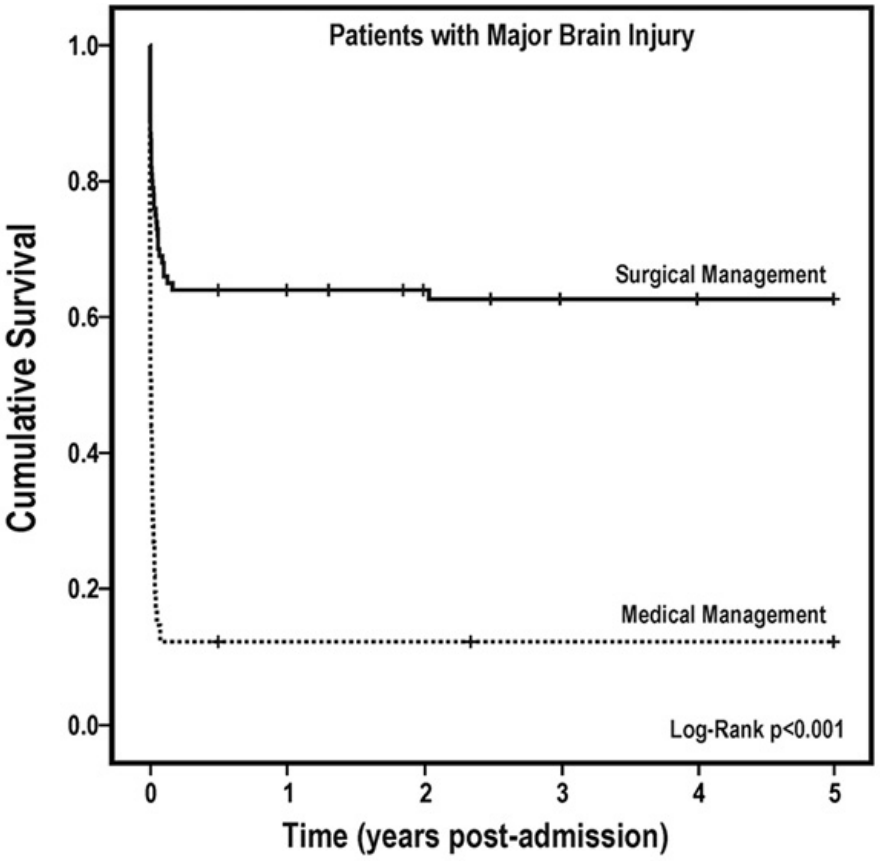
Brain injury reversal: **80.4% and 74.2%** of surgically treated stroke and coma cases, respectively

	CVA			Coma		
Outcome	Medical	Surgical	*P* value	Medical	Surgical	*P* value
Mortality	16 (76.2)	17 (27.0)	<.001	18 (100.0)	16 (44.4)	<.001
Discharged home	3 (21.4)	34 (61.8)	.007	0 (0.0)	17 (58.6)	<.001
CVA	NA	8 (15.7)		NA	3/31 (9.7)	
Coma	NA	2 (3.9)		NA	7/31 (22.6)	
Brain injury reversal	NA	4 (80.4)		NA	23/31 (74.2)	

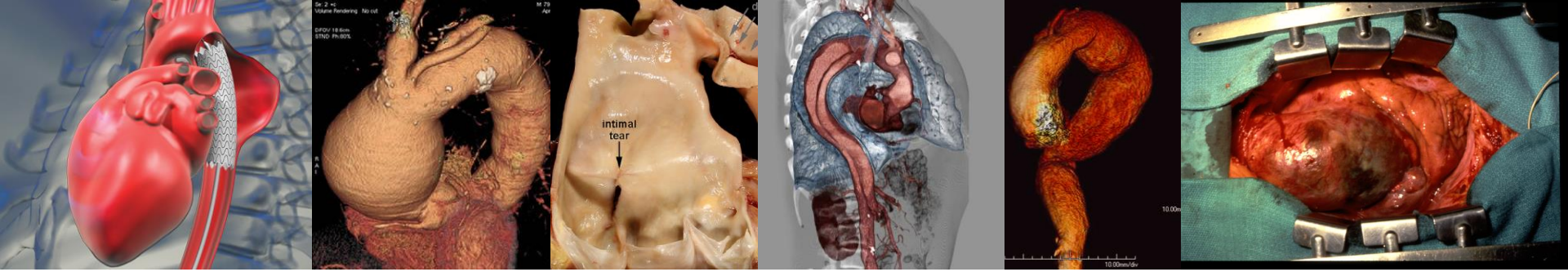
DiEusanio [IRAD] JTCVS 2013

Brain Injury and Type A Dissection

5-year survival significantly better with surgery

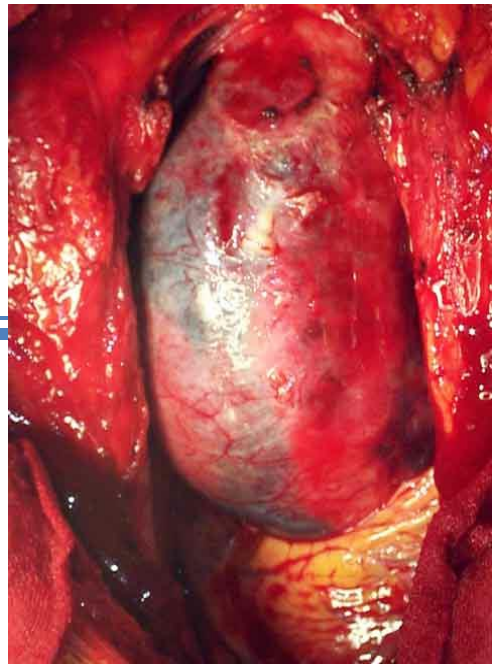


DiEusanio [IRAD] JTCVS 2013



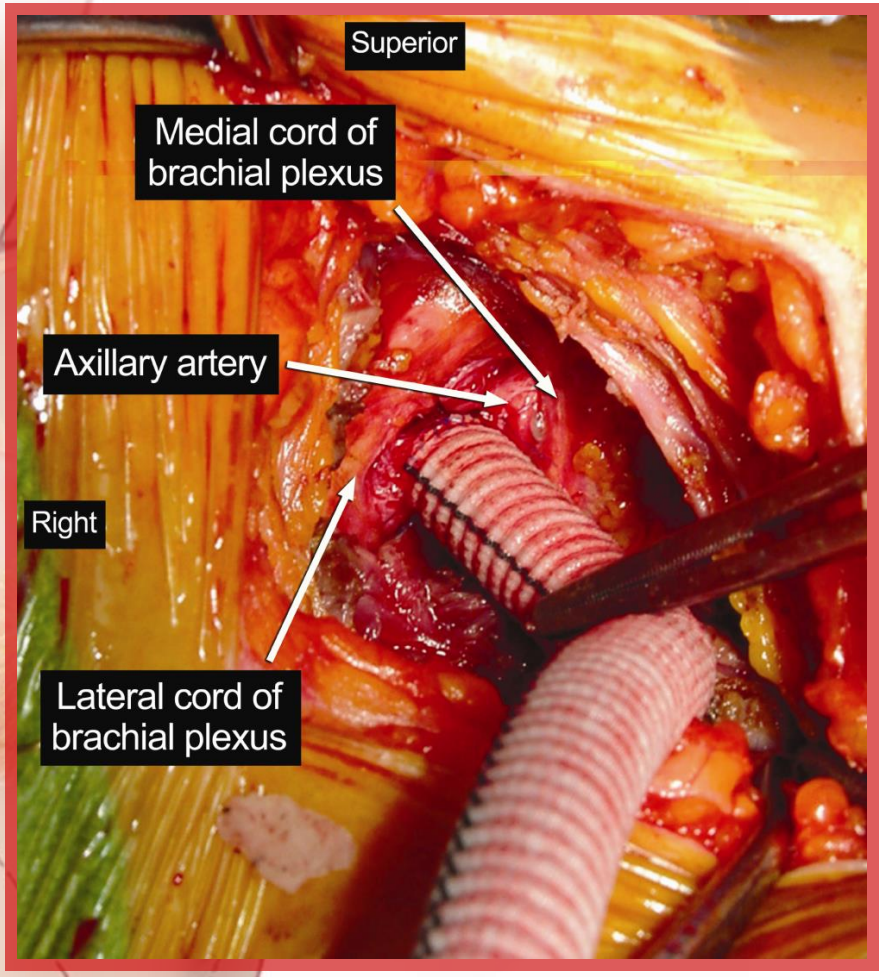
Conduct of procedure

Arterial cannulation

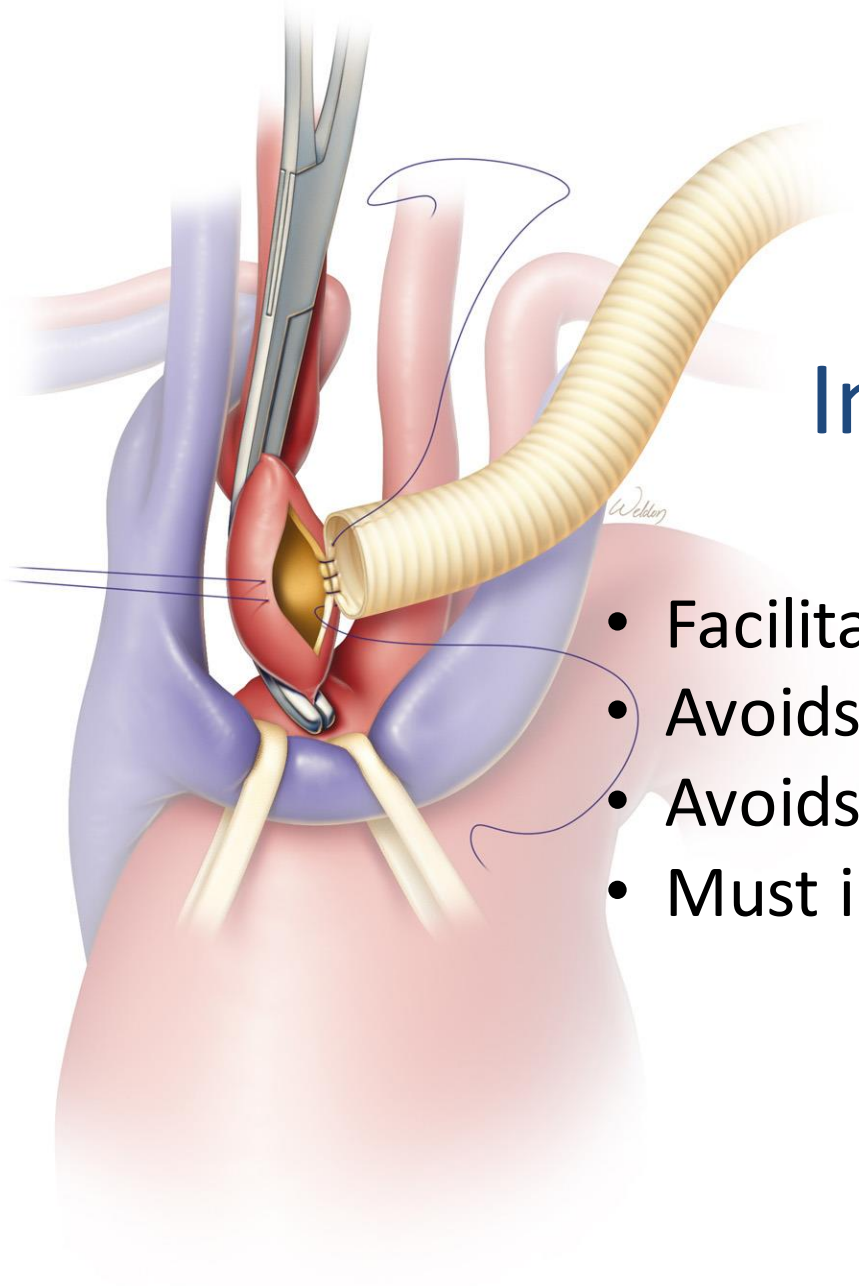


- Aorta or any large artery
  - Axillary, innominate, femoral, (carotid)
  - Direct cannulation of true lumen with seldinger + epiaortic US
- Monitor line pressures + true/false lumen flow on TEE when initiating CPB
  - Risk of malperfusion

Axillary artery cannulation



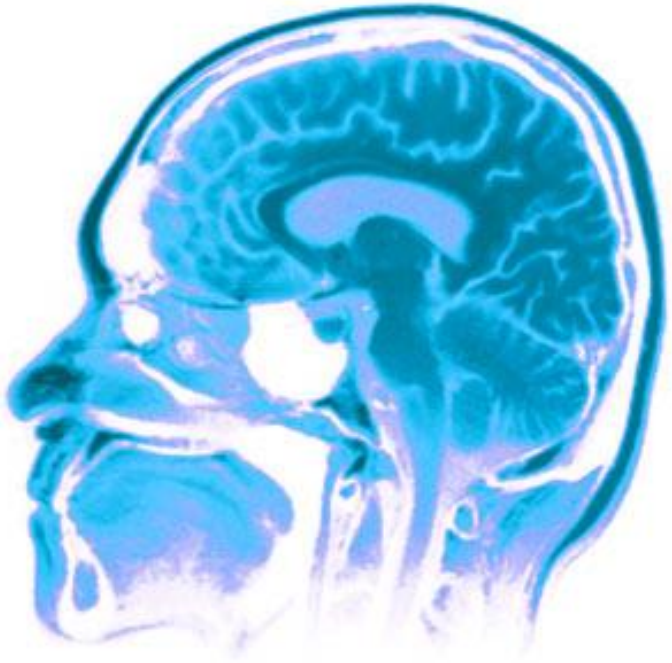
- **Delivery of ACP**
- **Avoids malperfusion**
- **Arterial access before sternotomy**
- **Remember to snare distal artery**



Innominate artery

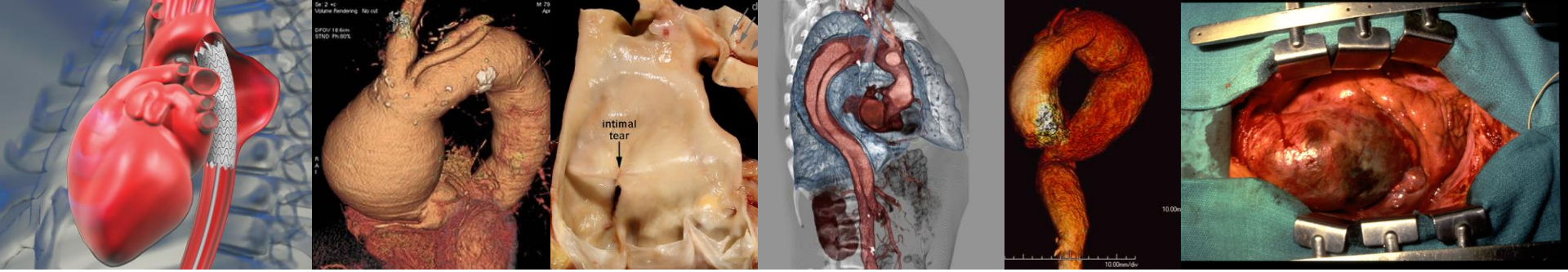
- Facilitates ACP
- Avoids 2nd incision
- Avoids local complications
- Must inspect CTA and artery directly

Brain protection



Cerebral protection

- Hypothermic circulatory arrest alone
- Retrograde cerebral perfusion
- Antegrade cerebral perfusion



Extent of resection

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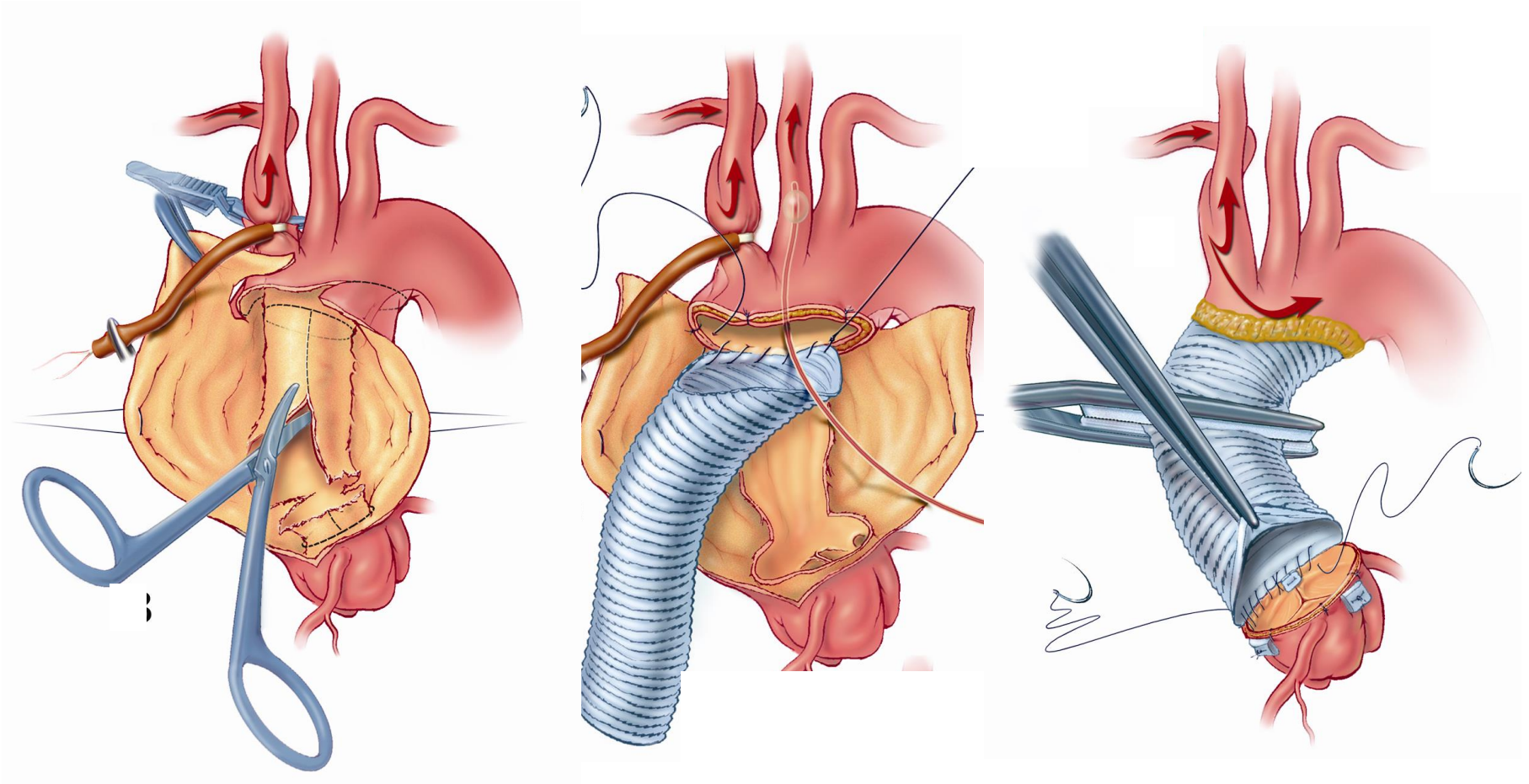
Standard type A repair

AKA Replacement of the ascending aorta with an open distal anastomosis



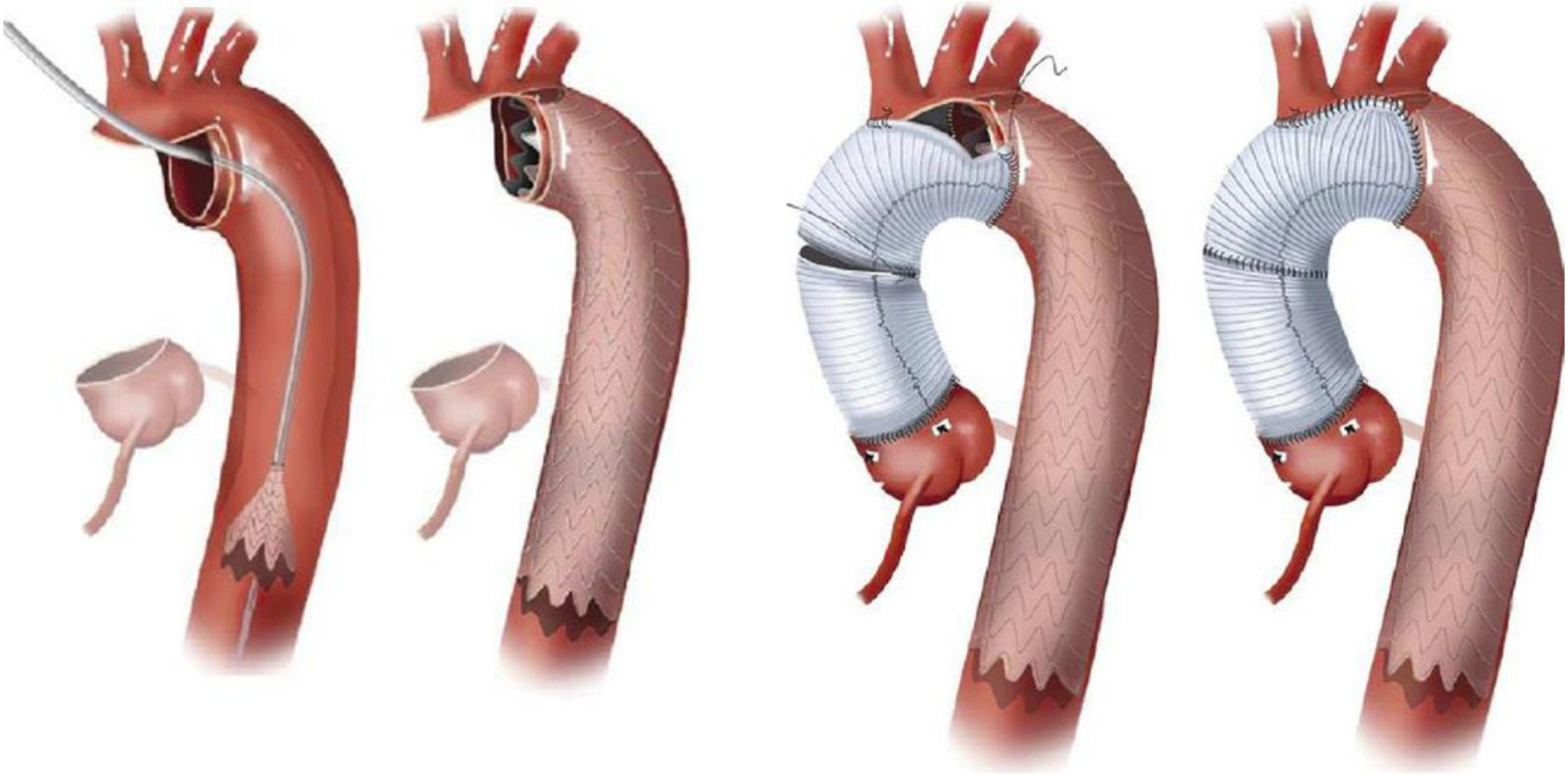
Root replacement

- Bentall vs valve-sparing root
- Indications to replace the root
  - Aneurysmal root
  - Tear in the root
- Also consider root replacement
  - Young
  - Genetically triggered aortopathies
  - Annuloaortic ectasia with severe AI

What about the distal aorta?

- Principles of extended distal repair
  - Seal tears extending beyond transverse arch
  - Expand distal true lumen and obliterate distal false lumen
- Potential to reduce
  - Early malperfusion and mortality
  - Late re-intervention and mortality

Hemi-arch with antegrade deployment of a standard TEVAR



Pochettino et al. Ann Thorac Surg 2009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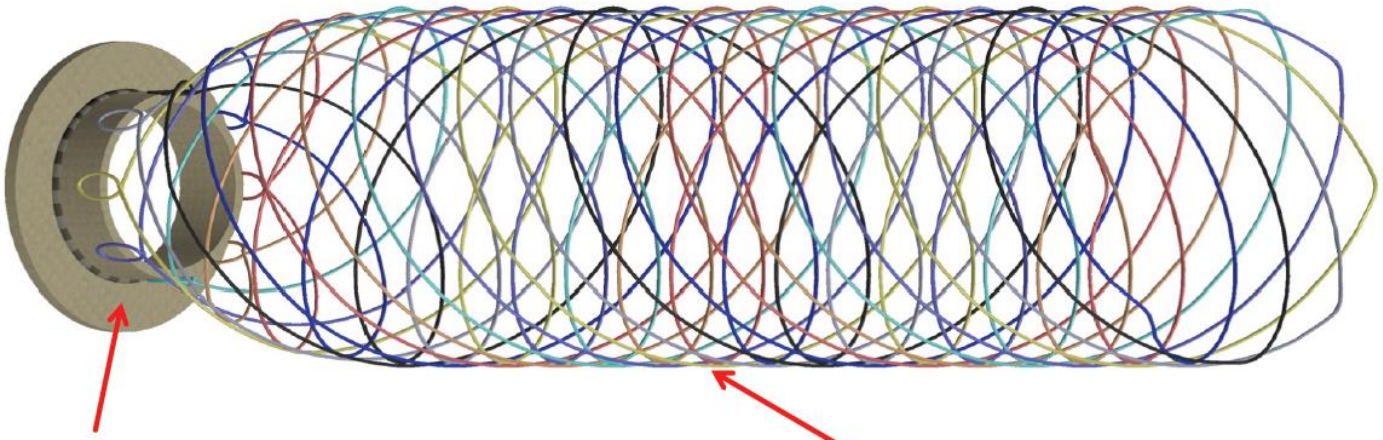
FET with total arch replacement

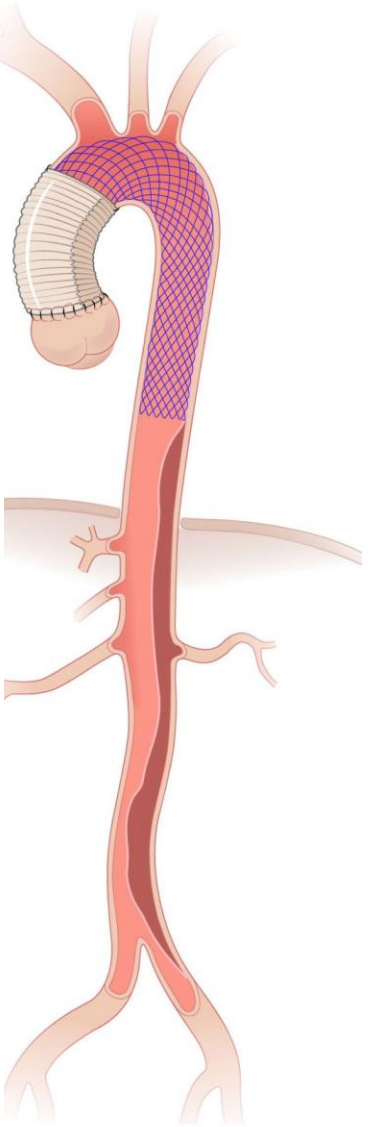
Ascyrus Medical (AMDS) Stent

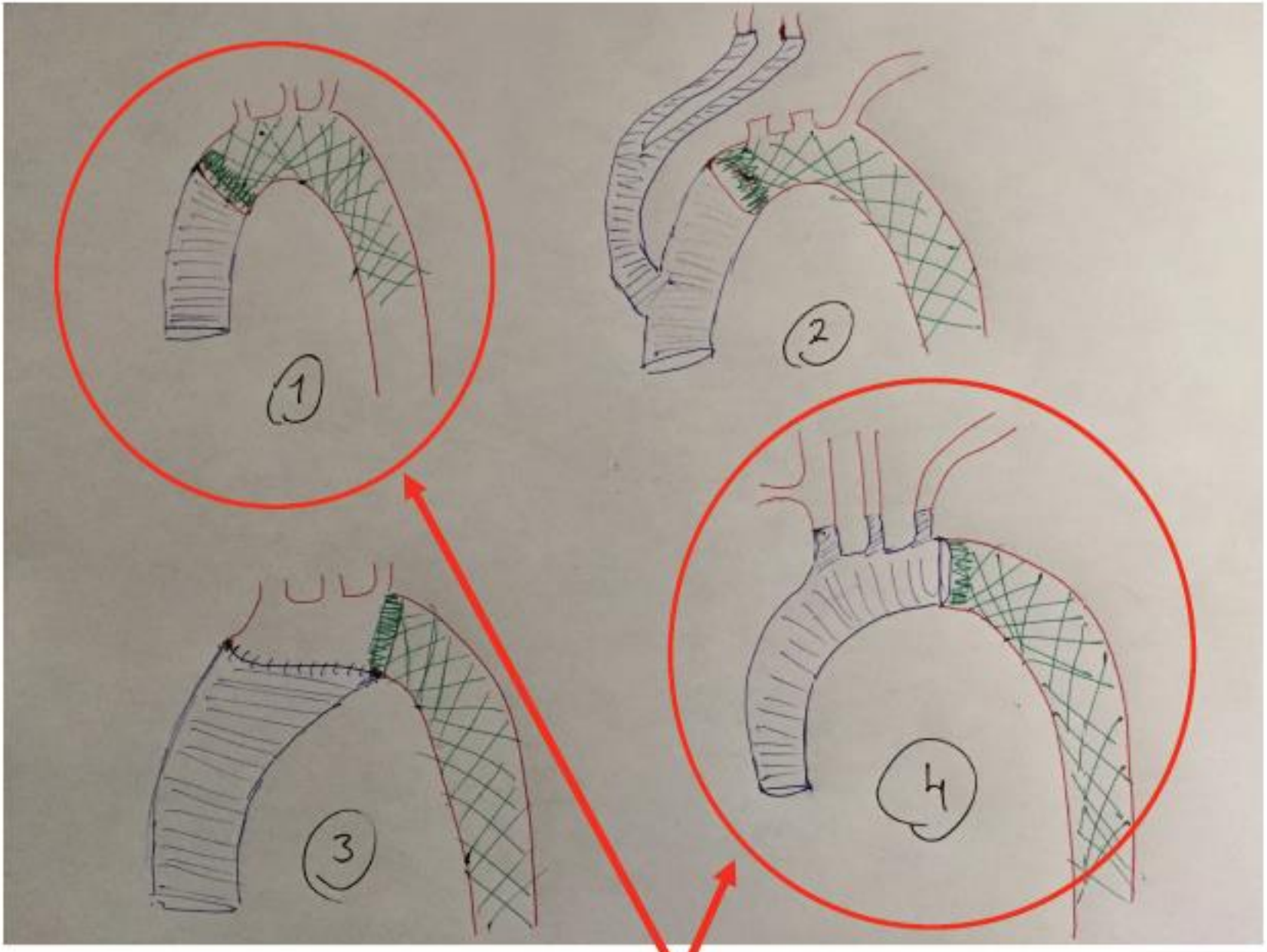
- Uncovered stent with proximal PTFE
- Very large wire crosses (up to 12mm) allow for flow to arch branches
- Adjunct to hemi-arch or total arch procedure



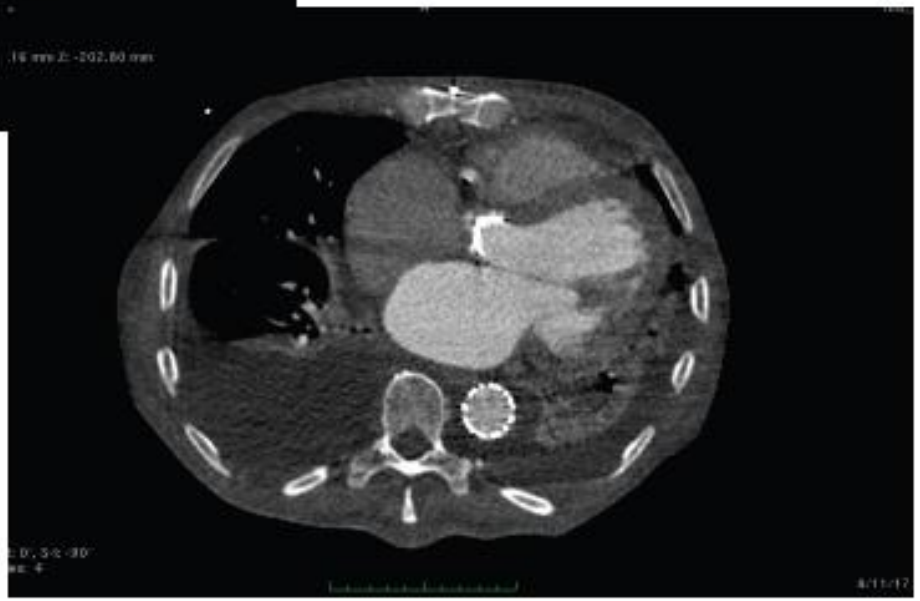
Proximal PTFE Graft Component

Distal Braided Stent Component (40mm/ 55mm- Straight and Tapered)





Most common implantation methods.



Follow-up imaging at 6 months

Canadian Cardiovascular Society/Canadian Society of Cardiac Surgeons/Canadian Society for Vascular Surgery Joint Position Statement on Open and Endovascular Surgery for Thoracic Aortic Disease

Jehangir J. Appoo, MDCM (Co-chair),[a] John Bozinovski, MD,[b] Michael W.A. Chu, MD,[c] Ismail El-Hamamsy, MD, PhD,[d] Thomas L. Forbes, MD,[e] Michael Moon, MD,[f] Maral Ouzounian, MD, PhD,[g] Mark D. Peterson, MD, PhD,[h] Jacques Tittley, MD,[i] and Munir Boodhwani, MD, MMSc (Co-chair);[j] on behalf of the CCS/CSCS/CSVS Thoracic Aortic Disease Guidelines Committee

Patient selection: extended distal repair

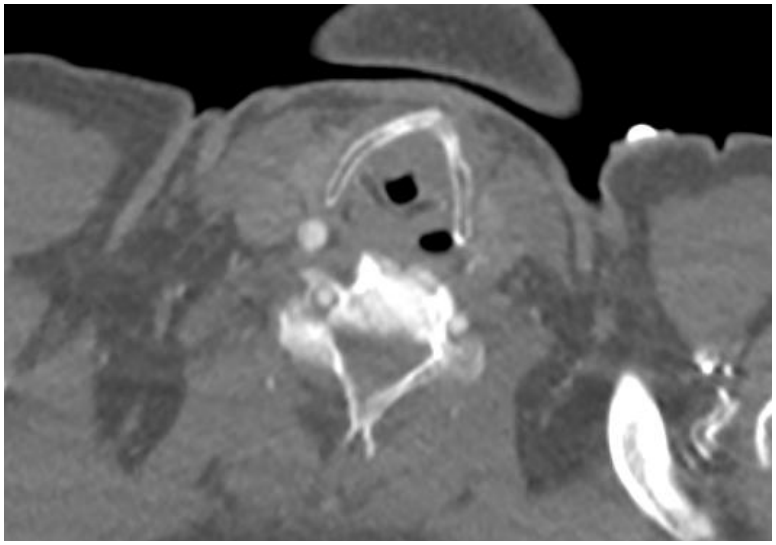
- Aneurysmal arch
- Tear in the arch or descending
- Distal malperfusion
- Young / connective tissue disorder
- Concomitant descending thoracic aneurysm

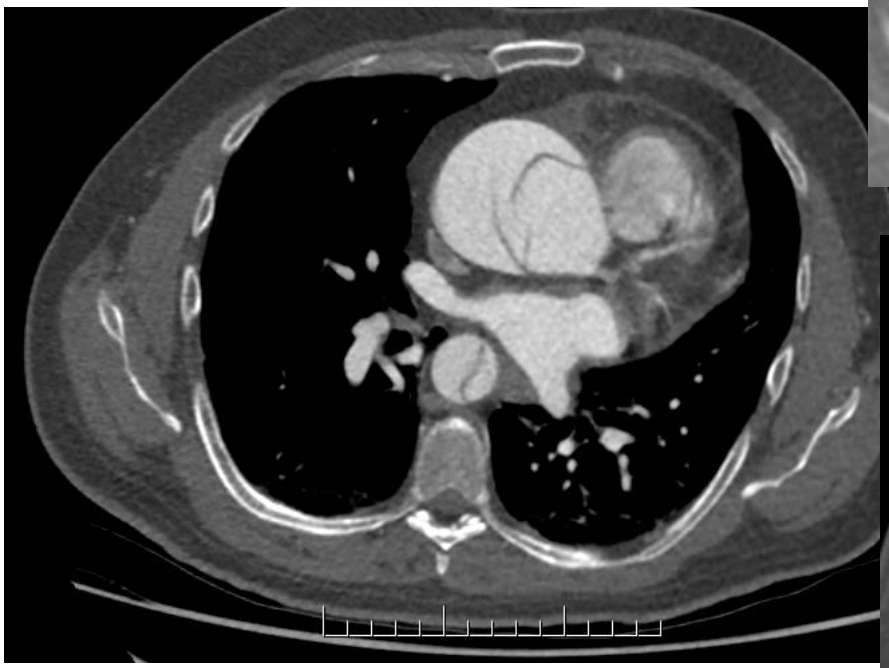
Appoo et al. *Can J Cardiol* 2016

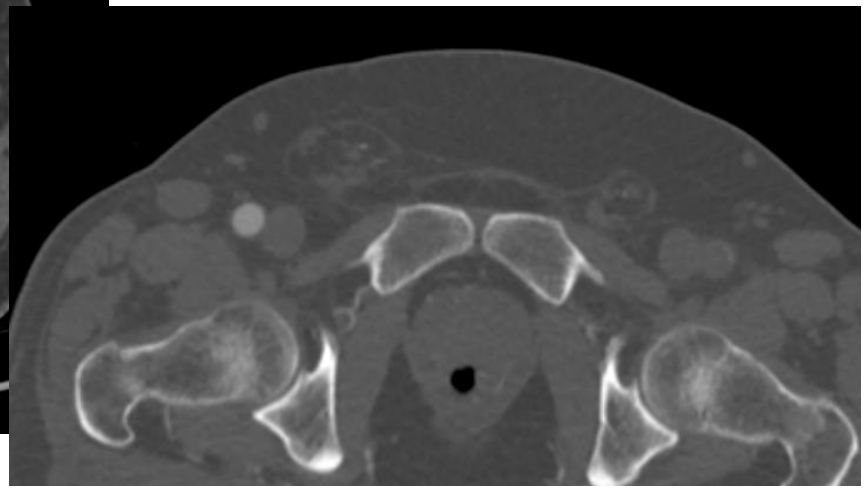
Case 2: Mr KJ

- 55 yo otherwise healthy male
- Developed chest pain then left leg tingling that led to ER visit – vascular consult
- Time from symptoms to assessment: 8 hrs
- On exam
  - Left leg ischemic but viable
  - No neuro deficits
  - Hemodynamics stable

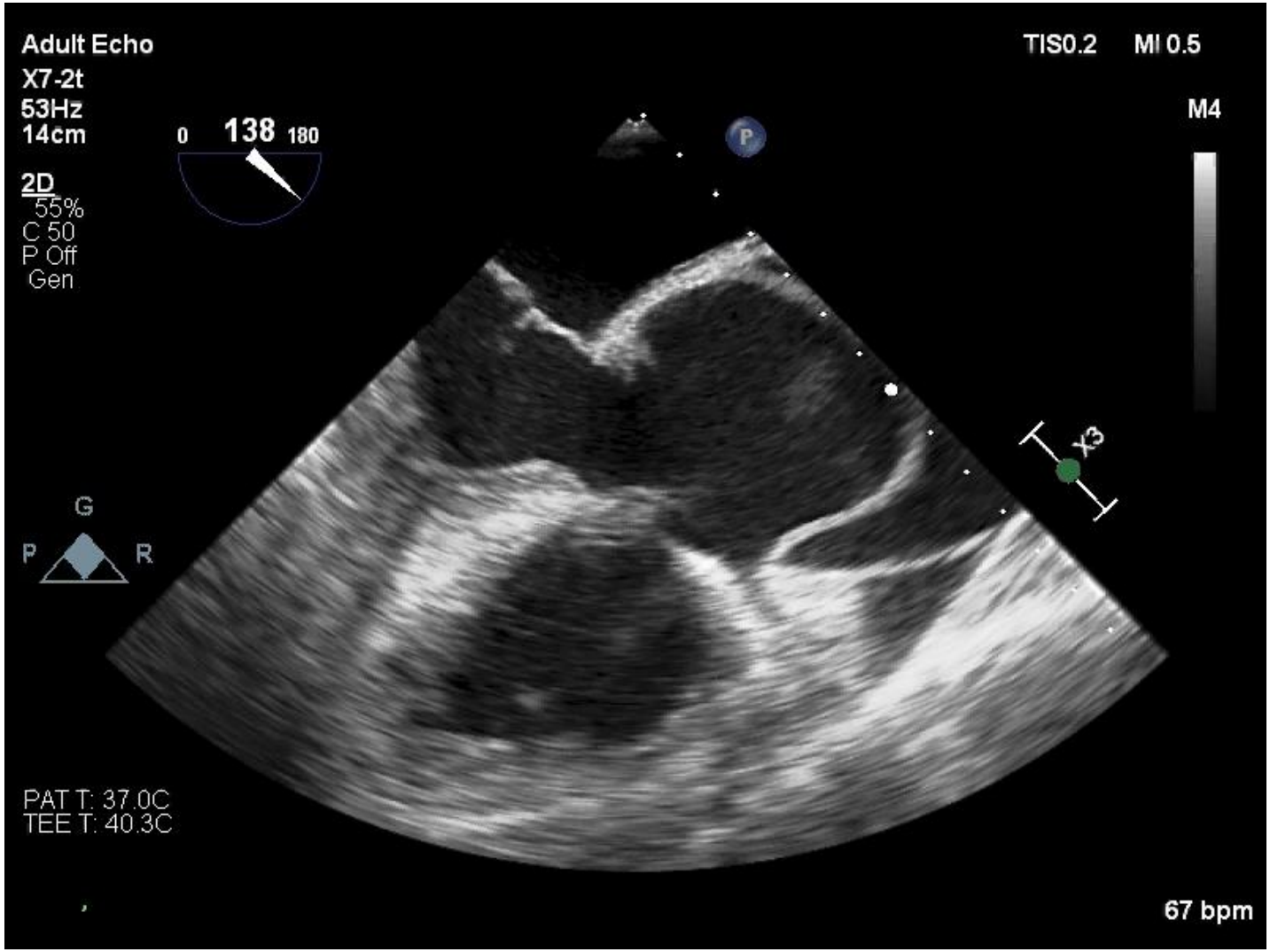
Case 2: Mr KJ



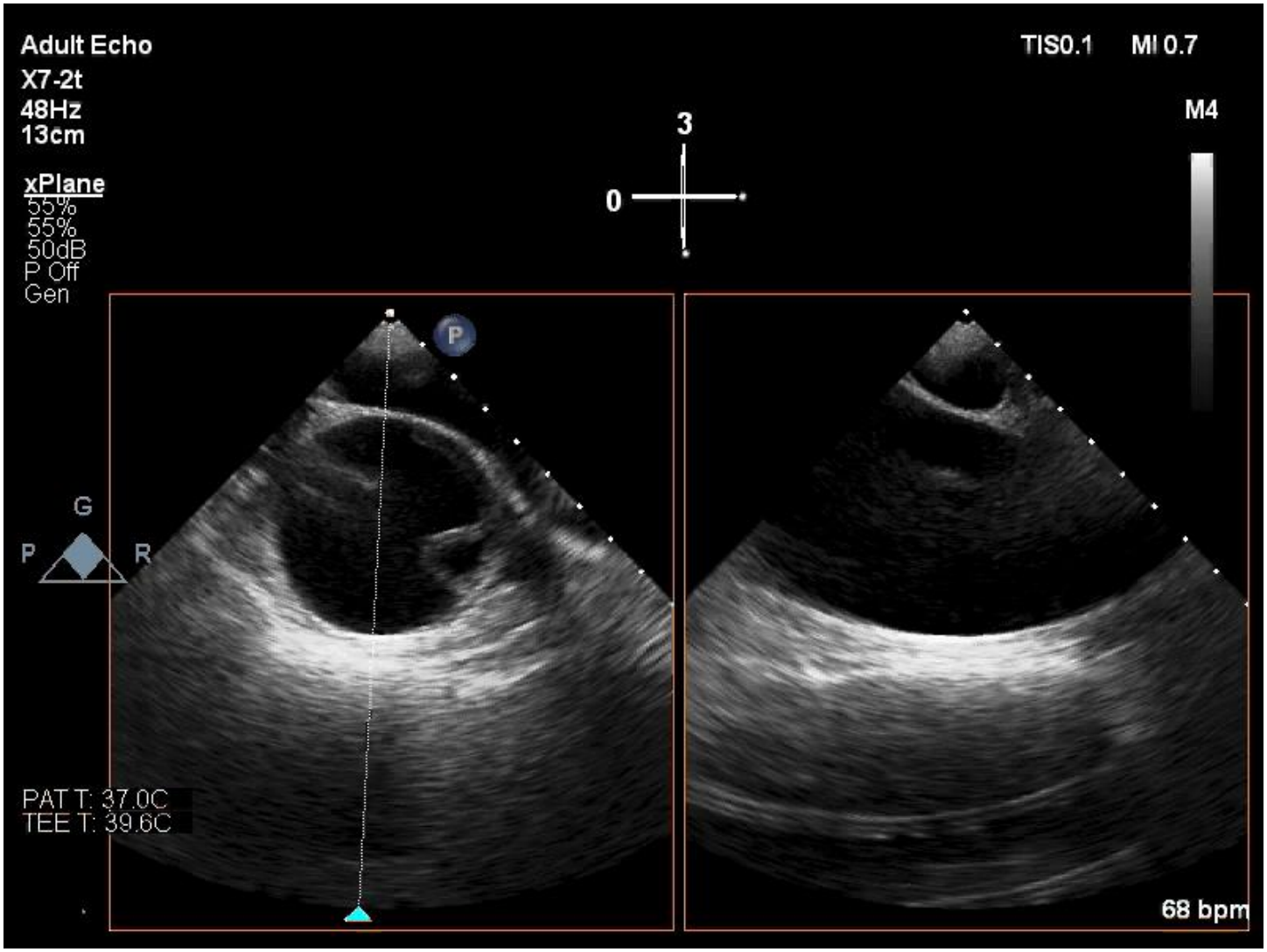




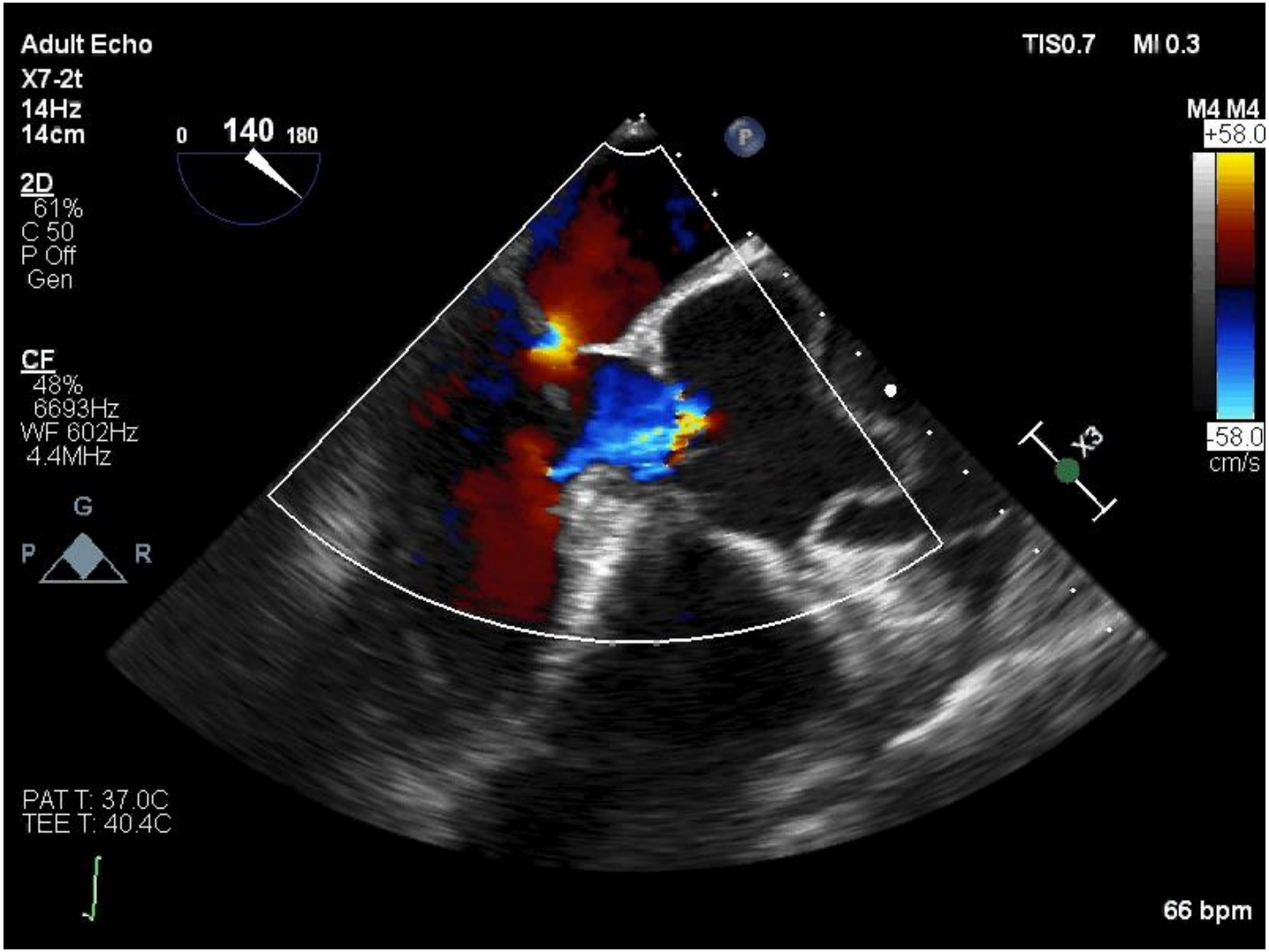
Case 2: Mr KJ


Adult Echo
X7-2t
53Hz
14cm
2D
55%
C 50
P Off
Gen
0
138
180
TIS0.2
MI 0.5
M4
P
X3
G
P
R
PAT T: 37.0C
TEE T: 40.3C
67 bpm

Case 2: Mr KJ

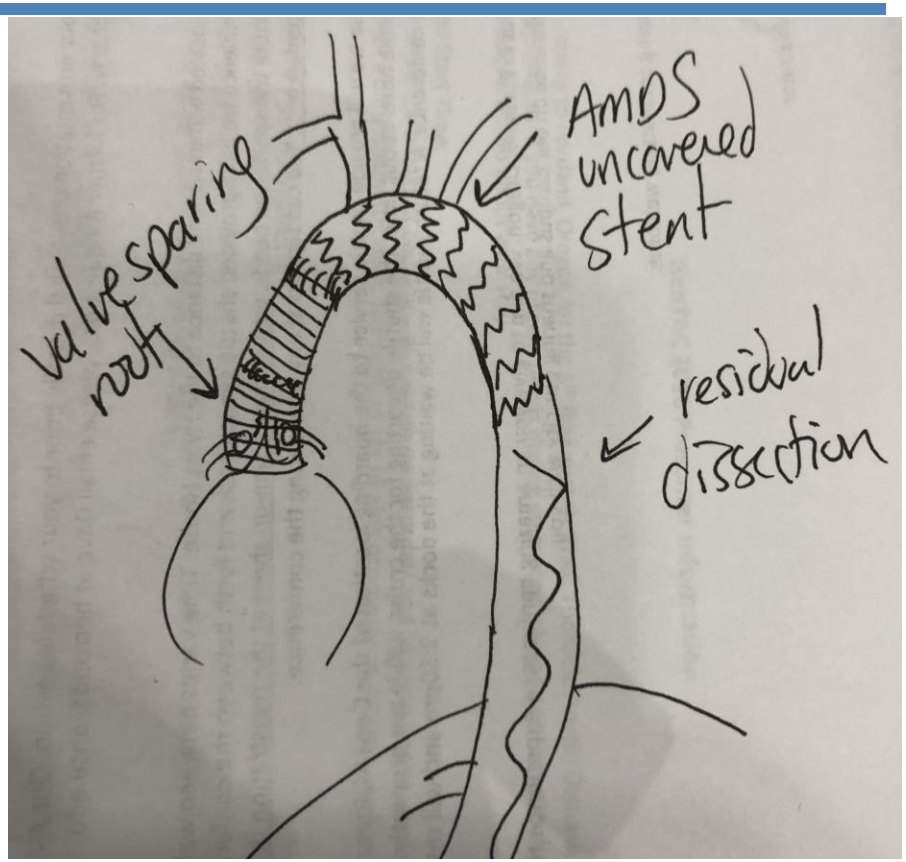

Adult Echo
X7-2t
48Hz
13cm
xPlane
55%
55%
50dB
P Off
Gen
TIS0.1
MI 0.7
M4
3
0
P
G
P
R
PAT T: 37.0C
TEE T: 39.6C
68 bpm

Case 2: Mr KJ


Adult Echo
X7-2t
14Hz
14cm
0
140
180
2D
61%
C 50
P Off
Gen
CF
48%
6693Hz
WF 602Hz
4.4MHz
G
P
R
TIS0.7
MI 0.3
M4 M4
+58.0
-58.0
cm/s
X3
PAT T: 37.0C
TEE T: 40.4C
66 bpm

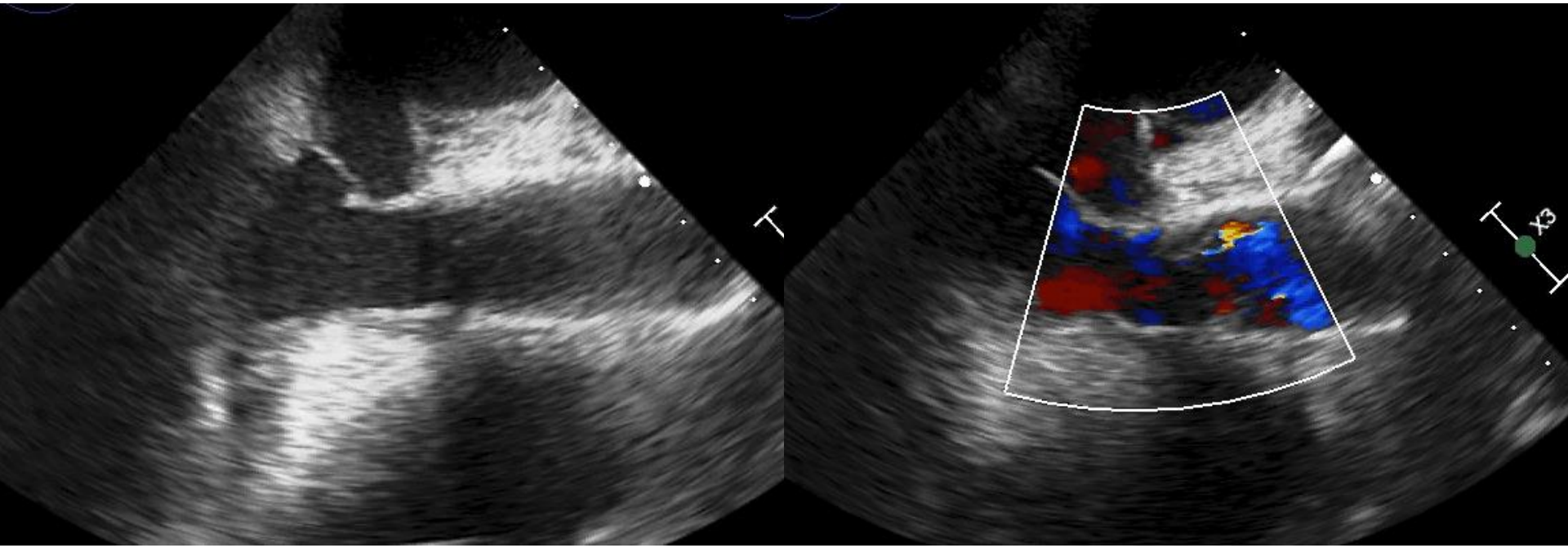
Surgical approach

- Innominate artery
- Central venous
- Cool to 22 oC – ACP
- Large root aneurysm
- Tear in ascending aorta
- Valve sparing root
- Deployment AMDS stent
- 28 mm graft at level of proximal arch



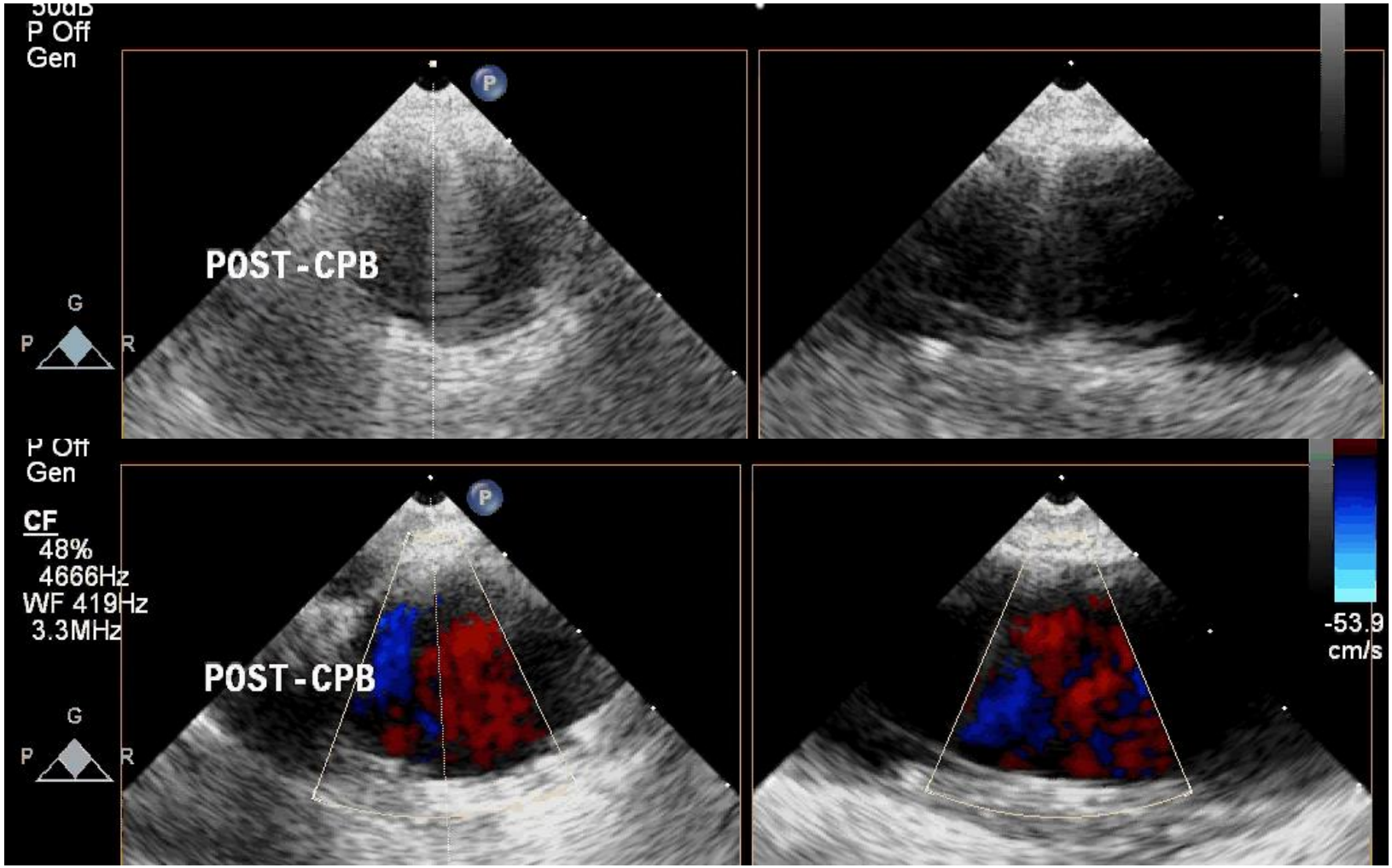
Case 2: Mr KJ

Post pump TEE: Assess proximal aorta / valve repair
Cusp prolapse, coaptation length/height, AI
Coronary flow, heart function

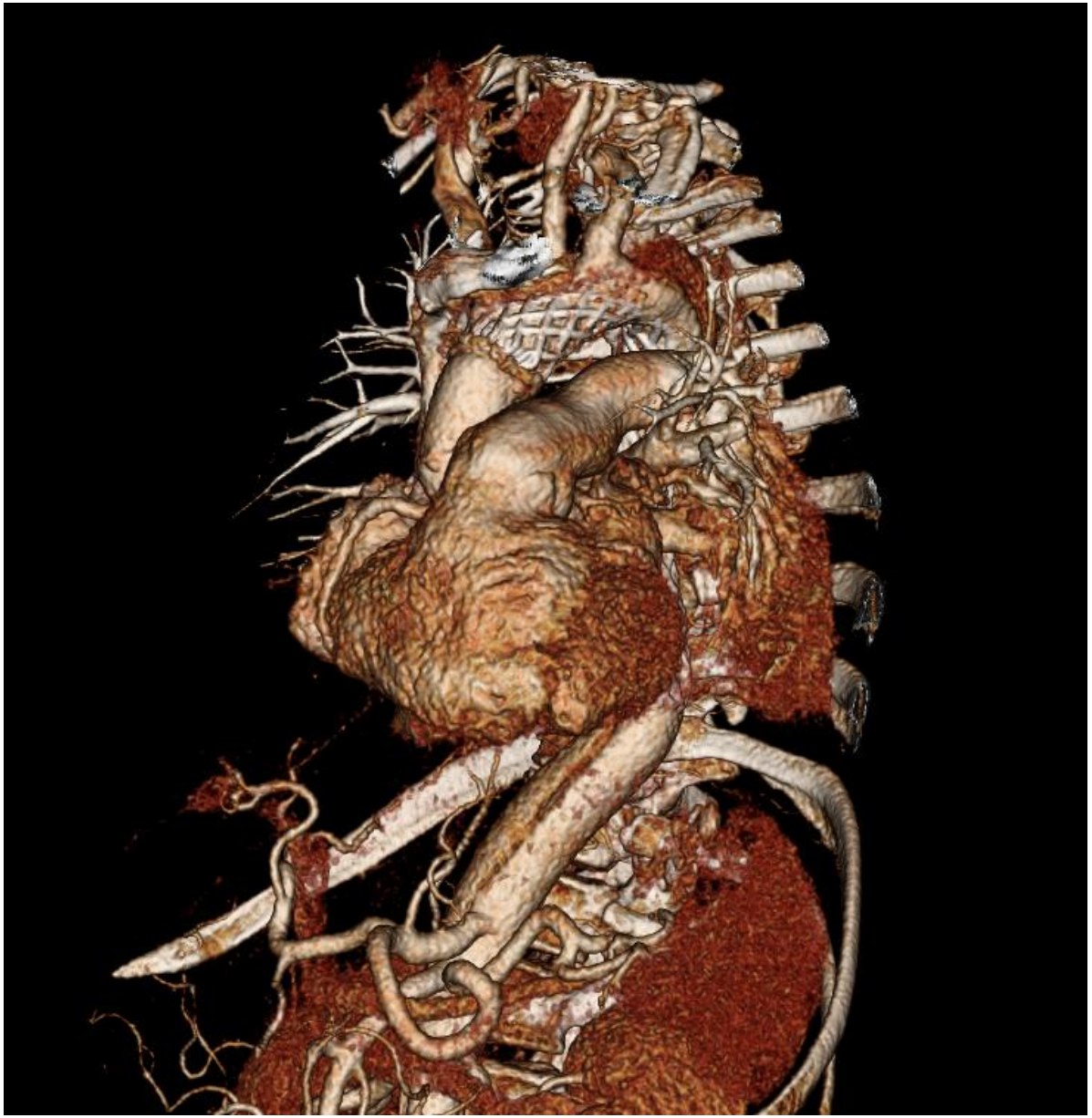


Post pump TEE: Assess distal aorta
True/false lumen flow
Frozen elephant trunk - stent expansion, flow

Case 2: Mr KJ



Case 2: Mr KJ



Summary

- Repair of type A dissection remains a challenge
- Surgical considerations include cannulation site, heart and brain protection, extent of proximal and distal resection
- Intraoperative TEE guidance is crucial to assessing initial pathology and repair

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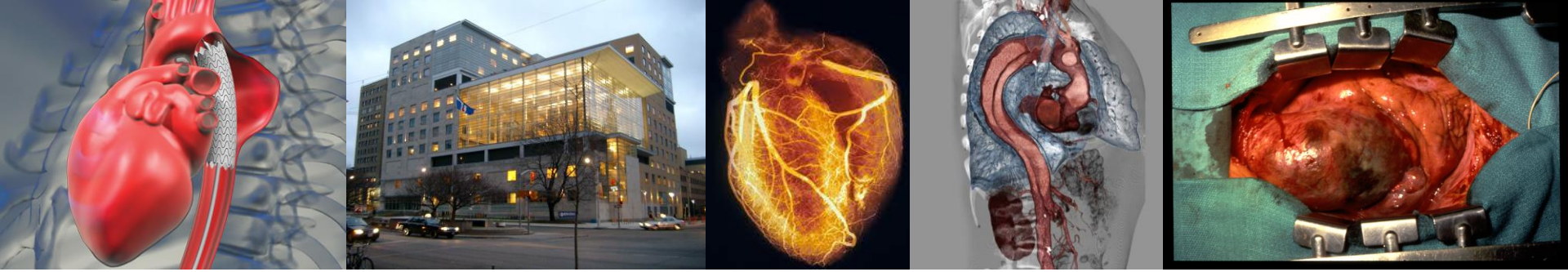

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